SPECIAL AEROBATICS ISSUE!

MODEL Airplane NEWS

THE ORIGINAL SINCE 1929

25 Ultimate Aerobats

PLUS!
Advanced Flight Moves
TIPS FROM THE PROS

PLUS
Giant-Scale **Setup Secrets**

IN THIS ISSUE

SCALE UPGRADE
HIDE YOUR ENGINE

EASY FPV
GET A BIRD'S-EYE VIEW

Display until January 5, 2016
February 2016 US $6.99 Canada $8.99
7 22627 48120 7 02
ModelAirplaneNews.com

CHROMA™
CAMERA DRONE

Epic Made Easy

On vacation or in your backyard, capturing epic aerial shots of everyday moments is easy with the Chroma camera drone from Horizon Hobby. It's available in four versions – two that give you everything you need in one box and two GoPro-ready versions designed for use with Hero 3 and Hero 4 cameras. All versions come with a long-lasting flight pack that delivers up to 30 minutes of flight time so you never have to rush to get the shot you want.

See all the ways the Chroma camera drone makes aerial photography easier.
Go to **flychroma.com** to learn more and find a retailer near you.

With Exclusive
SAFE® *Technology*

EVERYTHING IN ONE BOX NO SMART PHONE NEEDED

WITH STABILIZED CGO3
4K CAMERA AND ST-10+
TOUCH-SCREEN CONTROLLER
(BLH8675)

WITH STABILIZED CGO2+
1080P CAMERA AND ST-10+
TOUCH-SCREEN CONTROLLER
(BLH8665)

GOPRO-READY JUST ADD CAMERA

WITH SPEKTRUM™ DX4 CONTROLLER AND STABILIZED GOPRO-READY GIMBAL

(BLH8670)

BIND-N-FLY® VERSION WITH FIXED MOUNT

(BLH8680)

HORIZON® HOBBY

T18SZ

FASSTest, FASST, T-FHSS, S-FHSS Radio System

Futaba, distributed by Hobbico. HOBBICO

futaba-rc.com

It's here, the one you've been waiting for

An incredibly sophisticated 18-channel marvel, the 18SZ offers flight conditions and many of the functions and features of top-of-the-line systems at an affordable price. With this system, you get the dependability Futaba users TRUST along with a host of essential, versatile features.

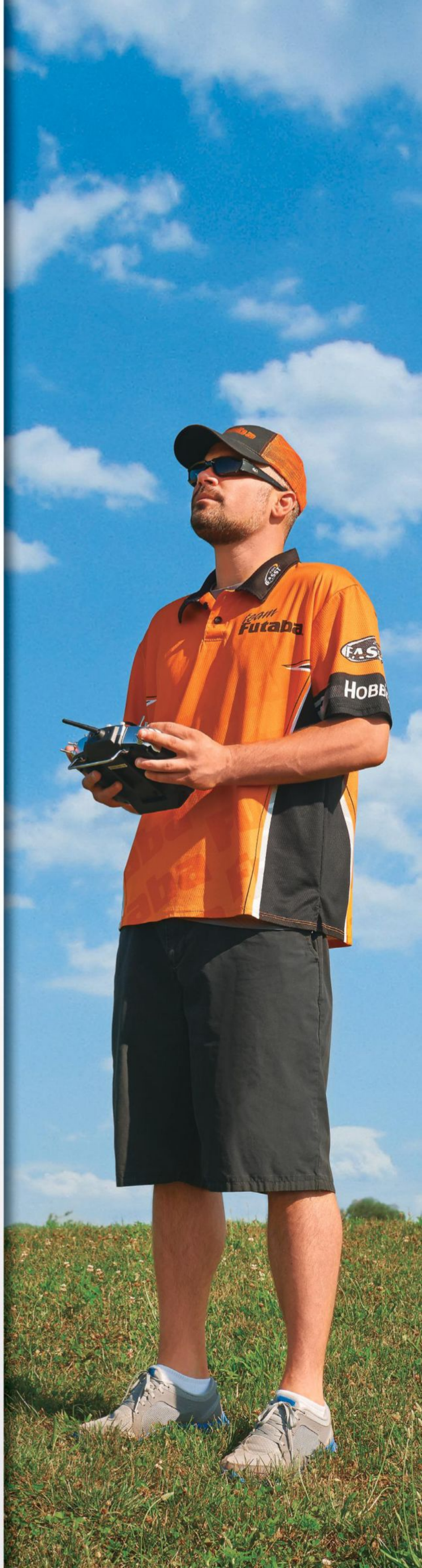
Full telemetry capability keeps you more tightly connected to your aircraft than ever before, and that's just the start. The 18SZ works with every 2.4GHz receiver Futaba sells. So, no matter what protocol receiver you fly with, no matter how insanely refined you need every control movement to be, this is the radio you need. Visit futaba-rc.com to learn all about it.

- 4.3 inch full-color fast-processing touch LCD screen for quick, clear data viewing and menu surfing
- 8 full conditions to customize every flight to your flying situation
- Telemetry temperature, RPM, altitude, GPS, voltage, current, and data logging to keep you more connected to your model than ever before
- 30-model internal memory that is memory card expandable to save your settings for all your aircraft
- 6.6V 2100mAh LiFe battery for 7 to 8 hours of flight time
- User-updateable software lets you keep your radio cutting edge
- 2 side levers, 6 digital trims, and 8 toggle switches to accommodate every function you can dream up
- Voice telemetry messages via speaker and earphone jack keep you up to date on your aircraft's flight data
- All programming functions needed for airplanes, helicopters, gliders and multi-copters

Includes:

T18SZ transmitter, R7008SB Receiver, 6.6V LiFe battery, switch harness, and mini screwdriver.

Futaba®



CONTENTS

Volume 144
Number 2
February 2016

Features

Flight Tests

Construction

Columns

Departments

ON THE COVER: Scale, precision, sport ... there's something for everyone in our "Ultimate Aerobats" feature on page 16.

MODEL AIRPLANE NEWS (USPS 533-470; ISSN 0026-7295) is published monthly by Air Age Inc., 88 Danbury Road, Wilton, CT 06897 USA. Periodicals postage permit paid at Wilton, CT and additional offices. Canadian Post Publications Mail Agreement No. 40008153. **SUBSCRIPTIONS:** in U.S., call (800) 827-0323; Canada and elsewhere, call (386) 246-3323; fax (386) 447-2321; or go to ModelAirplaneNews.com. U.S., $38.00 (1 yr.); Canada, $46.00, including GST (1 yr.); International $56.00 (1 yr.). All international orders must be prepaid in U.S. Funds; Visa, MC, Discover and AmEx accepted. **EDITORIAL:** Send correspondence to Editors, *Model Airplane News*, 88 Danbury Road, Wilton, CT 06897 USA. Email: MAN@airage.com. We welcome all editorial submissions, but assume no responsibility for the loss or damage of unsolicited material. To authors, photographers and people featured in this magazine: all materials published in *Model Airplane News* become the exclusive property of Air Age Media Inc. unless prior arrangement is made in writing with the Publisher. **ADVERTISING:** Send advertising materials to Advertising Dept., *Model Airplane News*, 88 Danbury Road, Wilton, CT 06897 USA; (203) 431-9000; fax (203) 529-3010; advertising@airage.com. **CHANGE OF ADDRESS:** To ensure that you don't miss any issues, send your new address to *Model Airplane News*, P.O. Box 420134, Palm Coast, FL 32142-0235 USA six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. For faster service, go to ModelAirplaneNews.com and click on the customer service link. **POSTMASTER:** Send Form 3579 to *Model Airplane News*, P.O. Box 420134, Palm Coast, FL 32142-0235 USA.

CHARGE WITH CONFIDENCE

Experience the ease and reliability of battery charging with our dual port AC/DC charge units, the X2 AC Plus and X2 AC Pro! Designed with maximum efficient power distribution capability, these power-packed chargers provide flexible battery charging for all your chemistry types whether you are in the workshop or out in the field. Grab our optional WiFi module to configure your settings and keep an eye on your charge progress with your Smartphone or PC!

GET CONFIDENT WITH HITEC!

X2 AC PRO

- AC Mode Output: Total 200W Power with Power Distribution
- DC Mode Output: 200W Port A, 100W Port B for Total 300W Power
- Includes 60W Soldering Iron, 400 to 840˚F

X2 AC PLUS

- AC Mode Output: Total 100W Power with Power Distribution
- DC Mode Maximum Output: 100W Per Port for Total 200W Power
- 10 Programmable Profile Settings

BOTH CHARGERS FEATURE:

- Power Distribution Mode for Ultimate Flexibility
- Built-in Power Supplies
- Use Either 11-18V DC or 100-240V AC Power Sources
- Adjustable Charge Current Rate of 0.1 ~ 10.0 Amps Each Port
- USB Support for PC and WiFi Smart Phone Interface

LiPo	LiHV	LiFe	LiIon	NiMH	NiCd	PB
1-6 cell	1-6 cell	1-6 cell	1-6 cell	1-15 cell	1-15 cell	2-20V

HITEC RCD USA, INC. | 12115 PAINE STREET | POWAY, CA 92064 | (858) 748-6948 | WWW.HITECRCD.COM

Preflight

BY DEBRA CLEGHORN | EXECUTIVE EDITOR

Put on a show!

If you're a high-energy pilot who likes to wow the crowd (or you want to be one), you're going to love this issue. To start, we highlight 25 of our favorite high-performance aerobats, all of which we have reviewed here in *Model Airplane News* or in our sister publication *Electric Flight*. All of our picks get high marks for flight performance (of course!), price, looks, and ease of assembly, and we've included electric-, glow-, and gas-powered aircraft in a variety of sizes and configurations so that you'll find exactly what you're looking for. Each of the aircraft featured in this issue comes with our highest recommendations.

And when you have that shiny new plane and are ready to head to the field, we have four fun maneuvers to add to your flight routine. In "Up, Down, and All Around," John Glezellis explains how to perform the reverse Cuban-8 with half rolls, the snap-rolling half circle, the vertical S, and the Figure 6 with half rolls. Starting with aircraft setup and some basic radio programming to make these moves easier, this feature tells you everything you need to know to put on a show like the pros. Just remember to fly "a few mistakes high" until you get it right (gravity is a cruel teacher!)

If your tastes run more to scale, we've also got you covered. In our feature on Frank Tiano's Twelve O'clock High event, contributor Rich Uravitch shares some great photos of the warbirds (and targets) at this year's festivities. From two giant-scale C-130 cargo planes to a sweep-wing F-14A Tomcat to a Vought V-173 1939 "Flying Pancake," this event had it all. We also have a construction article on the ultimate STOL aircraft: a Fieseler Fi 156 Storch with functional flaps and leading-edge slats. Last but not least, every model of a plane with a round engine deserves a scale cover-up, and senior technical editor Gerry Yarrish details how to create a rotary dummy engine as well as how to apply scale weathering with rattle-can spray paint.

Drop us a line at MAN@airage.com and let us know what you'd like to see more (or less) of in your magazine, and we'll continue our 87-year legacy of being your first source for RC aircraft inspiration and information.

MODEL Airplane NEWS
Est. 1929

EDITORIAL
Executive Editor Debra Cleghorn » debrac@airage.com
Senior Technical Editor
Gerry Yarrish » gerryy@airage.com
West Coast Senior Editor John Reid » johnr@airage.com
Associate Editor Matt Boyd » mattb@airage.com
Copy Editor Suzanne Noel

CONTRIBUTORS
Jason Benson, Sal Calvagna, Budd Davisson, Don Edberg, Mike Gantt, Dave Garwood, Dave Gierke, Greg Gimlick, John Glezellis, Aaron Ham, Clarence Lee, Jim Newman, Mark Rittinger, Jim Ryan, David Scott, Jerry Smith, Craig Trachten, Paul Tradelius, Pat Tritle, Rich Uravitch, Nick Ziroli Sr.

ART
Creative Director Betty K. Nero
Art Director Kevin Monahan

DIGITAL MEDIA
Web Producer Holly Hansen

VIDEO/PHOTOGRAPHY
Photographer Peter Hall
Videographer Adam Lebenstein

ADVERTISING
Advertising Director Mitch Brian
» 203.529.4609 | mitchb@airage.com
Senior Account Executive Ben Halladay
» 203.529.4628 | benh@airage.com
Account Executive Diane de Spirlet
»203.529.4664 | dianed@airage.com

CONSUMER MARKETING/PRODUCTION
The Media Source, a division of TEN,
The Enthusiast Network

MARKETING & EVENTS
Associate Creative Director Leslie Costa
Marketing Assistant Erica Driver
Event Manager Emil DeFrancesco

PUBLISHING
Group Publishers Louis V. DeFrancesco Jr.,
Yvonne M. DeFrancesco

FOLLOW US
On Facebook: modelairplanenews
Follow us on Twitter: @modelairplane
Instagram: instagram/modelairplanenews
Visit us online: ModelAirplaneNews.com
Comments may be sent to: MAN@airage.com

ASK FOR *MODEL AIRPLANE NEWS* AT YOUR LOCAL HOBBY SHOP!
HOBBY SHOP DISTRIBUTION BY:
Kalmbach Publishing Co. (800) 558-1544 ext. 3
NATIONAL AND INTERNATIONAL DISTRIBUTION BY:
Kable Distribution Services, (212) 705-4600

AirAGE MEDIA
EDITORIAL OFFICE
88 Danbury Road, 2B, Wilton,
CT 06897 USA
EMAIL MAN@airage.com
PHONE (203) 529-4635

MPA The Association of Magazine Media

RCX RADIO CONTROL & HOBBY EXPO
RCX.com

PRINTED IN THE USA

Airwaves

YOUR FEEDBACK

We love hearing from our readers: Your emails, tweets, and comments quickly let us know what you'd like to see more (or less!) of in upcoming issues and online. Here's what some of you are saying about *Model Airplane News* magazine.

ModelAirplaneNews.com › Giant Flying Fortress with Escort

At a recent RC fly-in in Germany, a (really) big RC B-17 Flying Fortress, teamed up with a giant-scale P-47 and F4U Corsair to wow the crowd with a fantastic flight. Here's what you said about this great video.

Mike Van Vollkenburg: Most awesome! My father was a B-17 navigator, so this was a real treat. Thanks so much.

Norman Van Den Handel: Ouch! Sad about the Corsair!

Allan Hutley: The fighters must have been powered by VWs.

Lance Booty: Damn, the F4U pilot must not have seen the edge of the cornfield. He should have had a spotter.

Facebook › Fly the Elevator

One of the first 3D maneuvers that many RC pilots learn is the "elevator," and when we shared on Facebook some tips from contributor John Glezellis on how to perform this move, readers were equally challenged and, well, a little nervous about trying it.

FH: Before "3D," this was called a "parachute" and was used for steep descent without gaining speed in planes without flaps full scale.

WRJ: Translation: Learn how to rekit in one easy maneuver!

JT: I've been flying the Hangar 9 Beast for years. It does amazing "elevators"!

✉ IN OUR MAILBOX

LOWERS-MINGES LM-1 RACER

I got my January issue of *Model Airplane News*, and I just ordered a set of plans for Mark Rittinger's racer. I actually saw Mark's model on display at the Toledo show and thought it was cool back then. I am thinking about making it glow powered and adding some retracts. Do you have any suggestions?
—Raymond Watkins

Raymond, Mark is a great designer for sure. He keeps on cranking out great flying models. Any good .30 to .40 2-stroke glow engine should easily power the LM-1, and there's ample room for the engine, fuel tank, and throttle servo. Adding retracts, however, would add weight as you would also have to reinforce the wing in the area where the gear attach. It is doable, but the added weight would increase wing loading and landing speed. If I were to do it, I'd use E-flite's electric gear, and I would stretch the wing a good 6 to 8 inches to increase the area. Good luck. —*GY*

Erratum On page 39 in the December 2015 issue, we did not identify the manufacturer of the 3-blade propeller shown in a static photo of the Phoenix Model Dauntless. That propeller is from Master Airscrew (masterairscrew.com), and we regret any confusion this might have caused.

Parrot

BEBOP DRONE 2

YOUR FLYING COMPANION

25 MIN FLYING TIME | **FULL HD** VIDEO STABILIZED ON 3-AXIS | **14.0** MEGAPIXELS | **GPS** FLIGHT PLAN | **FPV** COMPATIBILITY

500 G / 17.6 OZ SAFE AND LIGHTWEIGHT | WI-FI MIMO EXTENDED **RANGE** 2 KM* WITH SKYCONTROLLER

FreeFlight 3

Download on the App Store

ANDROID APP ON Google play

*Maximum range depends both on wireless settings and flight environment
iPhone, iPad not included

Pilot with smartphone
or Parrot Skycontroller
Black Edition

www.parrot.com

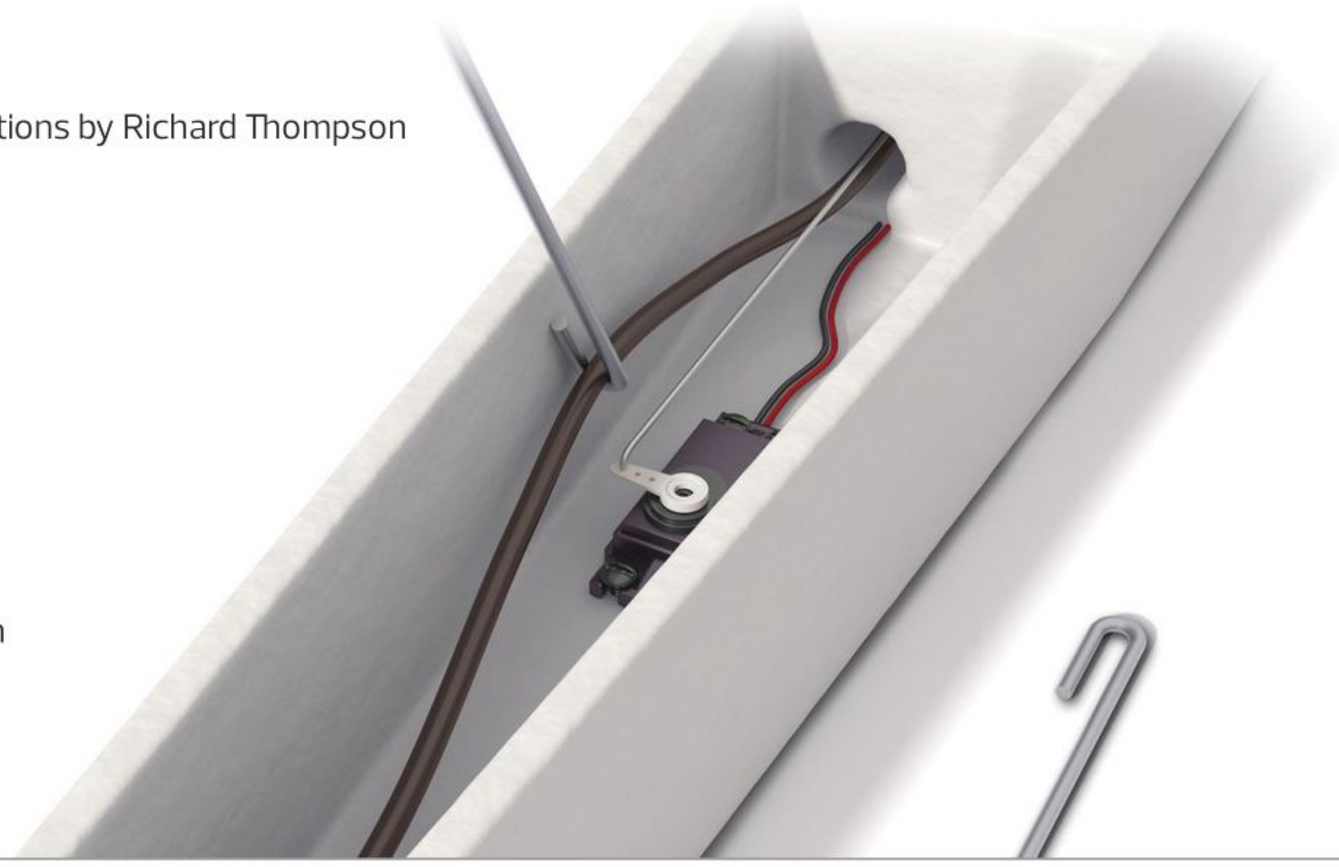
Tips&Tricks

USEFUL HINTS FROM MODELERS | Illustrations by Richard Thompson

WIRE HOOK

When moving wires and linkages around in hard-to-reach areas of my RC planes, I take an old pushrod and create a U-shaped bend on one end to assist with alignment. This is much quicker than struggling with my fingers in those tough corners. The U-bend allows you to grab onto those wires and place them exactly where you want them, then release them with a simple twist.

Brian Kauf, Santa Rosa Beach, FL



CLEVIS KEEPERS

A friend of mine just lost his airplane because the elevator control horn and the pushrod clevis parted company. When I helped him gather the pieces, I noticed that he did not use any type of keeper on his control surfaces' clevises. I showed him mine, which have small lengths of silicone fuel line slipped in place to keep the clevises from opening up. I use long-nose pliers to stretch and slip the "keepers" in place. They cost almost nothing!

Whitney Philbrick, Nolensville, TN

BALL-LINK WASHERS

In my giant-scale model, I use heavy-duty 4-40 ball links where there is a lot of vibration, like on my throttle linkage; also, the ball links help minimize slippage when the linkage is at an angle. Every now and then, I have found that the links can pop off. To prevent this, I add a small washer under the attachment bolt. This prevents the clevis link from lifting up past the bolt head without interfering with the smooth operation of the linkage.

Danny Carozza, Yonkers, NY

ENGINE STORAGE

I have found that plastic margarine containers with snap-on lids make excellent engine storage containers. I sprinkle some baking soda in the bottom (to absorb moisture) and then I add some paper towels. After I have cleaned my engine and oiled it well with Marvel Mystery Oil, I put the engine in the container and place it on the shelf for safekeeping.

Jim Newman, Kent City, MI

SEND IN YOUR IDEAS! We want your ideas for Tips & Tricks! This month's winners will receive a $50 glue assortment from Bob Smith Industries. Send a photo or rough sketch and a brief description to MAN@airage.com or *Model Airplane News*, c/o Air Age Media, 88 Danbury Rd., Wilton, CT 06897 USA.

Why use anything else?

Used by industry, but available from your local hobby shop.

Manufacturers, like most modelers, demand the best performance from their adhesives. That is why Boeing, Cessna, Beechcraft, Tesla, SpaceX and many other high tech firms choose BSI. With a larger selection of CA and epoxy adhesives than any other hobby manufacturer, BSI provides modelers with consistent high performance, all available from your local hobby shop.

BOB SMITH INDUSTRIES INCORPORATED

"Your Adhesive Company for Over 30 Years."

To find a dealer or ask a question of The Glue Pros, go to:
www.bsi-inc.com • info@bsi-inc.com • (805) 466-1717
8060 Morro Road • Atascadero, CA 93422 • USA

Find us on Facebook at Bob Smith Industries

Pilot Projects

SHOWCASING WHAT YOU BUILD & FLY | Email entries to: MAN@airage.com

SOPWITH F1

Eduardo Roesch, Guatemala

We really like this plane, and we love its pilot! Eduardo sent this photo of his 1/4-scale Balsa USA kit-built Sopwith F1 powered by a DLE 30cc engine. The plane is painted to replicate a Camel that's in an Australian museum. Eduardo notes that 8-month-old pilot "Panda" is the squadron pet of his airplane club and is being trained to be a therapy dog.

PILOT PROJECT OF THE MONTH

DOUBLE MUSTANG

Matt Eberhard, Pierre, South Dakota

After learning to fly with a Hangar 9 P-51 trainer, Matt ordered another. He writes, "The electronics are in one fuselage, and the batteries are in the center wing section. The beauty is that the center wing is kept perfectly lined straight via the wing tube, which I oiled and used while gluing the center section made from two wings."

SBD-5 DAUNTLESS ARF

Allan Quiat, Houston, TX

This VQ Models 5-foot-span warbird has working dive brakes, E-flite electric retracts, a Futaba radio system, and a Saito 82 four-stroke engine for power. Allan notes that VQ did a nice job imprinting the panel lines and markings into the adhesive-backed covering.

ROTORPLANE

Les Littlefield, Simi Valley, CA

Intrigued by Roy L. Clough Jr.'s article, "R/C Flettner Proof of Concept Rotorplane," in the July 1993 issue of *Model Airplane News*, Les built an electric version and lightened the structure by 7 ounces. He writes, "Takeoffs are scary, but once it's airborne, it flies similar to an autogyro: mostly throttle and rudder."

SEND IN YOUR PICTURES! *Model Airplane News* is your magazine, and we encourage reader participation. Email your high-resolution images to MAN@airage.com with your contact information and details on your project. Every pilot we feature will receive a *Model Airplane News* baseball cap, and the "Pilot Project of the Month" winner will receive a $200 gift code for anything at jramericas.com.

2 FREE RECEIVERS!

That's right, our incredible 2 FREE Receivers promotion is back. Purchase ANY JR DMSS Radio System from your favorite JR Authorized Retailer from November 1, 2015 to January 31st 2016, and we'll send you 2 additional JR RG712BX Receivers FREE! A $170 Value.

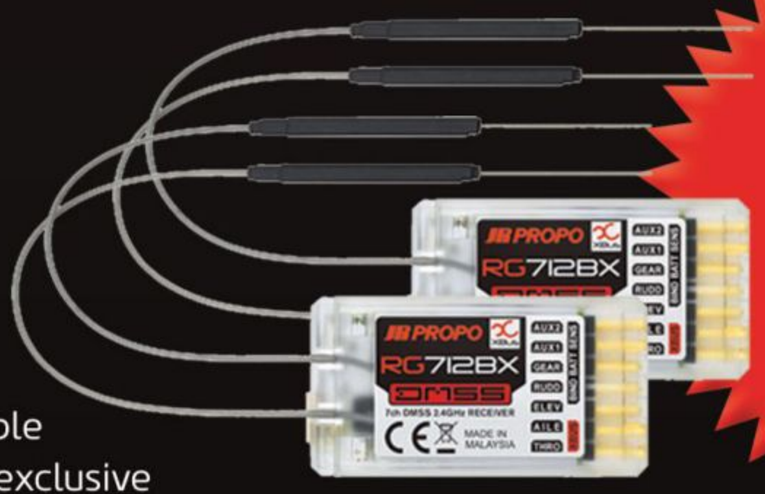
3 YEAR LIMITED WARRANTY

THE DMSS / XBus Difference

When you move up to a genuine JR DMSS system, not only will you feel the difference that only a true JR quality system can offer, you will also open your modeling options up to the incredible world of JR's high-speed, high RF resistance DMSS protocol with exclusive XBus Serial connectivity.

With XBus, complex multi servo radio installations become simple, and servo power distribution issues a thing of the past. Compatible with most all brands/types of servos, XBus can easily be used to update your existing fleet.

In addition, for those wanting the ultimate in servo adjustability and performance, JR's new NX Series XBus programmable Smart Servos™, adjustable directly through your DMSS/XBus equipped system, provide a plethora of performance enhancing adjustments to take your model's flight performance to new levels.



2 FREE RG712BX RECEIVERS $170 value!

With all this quality, innovation, free receivers, AND the BEST warranty in the industry to back it up, there's never been a better time to move up to a new JR DMSS System.

So, visit your favorite JR Retailer and pick yourself up a new JR DMSS Radio.

We're sure you'll feel the *JR DMSS Difference* from the very first flight...

XBus

DMSS 2.4GHz

Offer valid for new purchases of a JR DMSS Radio System during the time period of November 1, 2015 through January 31st, 2016 from any authorized JR Retailer located within North/South Americas including the Carribean. Offer is of no actual cash value. JR Americas reserves the right to modify or cancel this offer without notice. Cannot be applied/combined with other offers.

To print your copy of the 2 FREE Receiver form, visit:

// JRAmericas.com/2FREERX

Or call toll free: (855)-868-8700

sales@jramericas.com

JR® AMERICAS

Dealer Inquiries Welcomed

ULTIMATE

Top 25 editor picks

+ pro pilot flight tips!

BY **JOHN REID**

One of the nice things about being an editor here at *Model Airplane News* is that we get to try out a lot of new planes, and our absolute favorites have to be aerobatic models. When asked, every editor had more than one top aerobatic aircraft that they enjoy flying. Here are 25 of our picks for some of the best aerobatic airplanes out there that would be able to perform any maneuver your thumbs and mind could create. This list is sure to contain that special plane to add to your hangar. Once you have the aircraft, you may want to test out your flying abilities against fellow pilots, and there is no better way to do that then participating in an aerobatic competition. But going to your first competition can be intimidating. That is why we asked some of the pilots now competing in today's top aerobatic competitions for some advice on flying in your first event.

E-flite UMX Pitts S-1S

The Pitts Special can be a challenging to fly in model form—that is, until the designers from E-flite made it their mission to tame this minuscule aerobatic mount. This plane is fully aerobatic right out of the box; no special tweaks or transmitter mixes are required. The performance envelope is so wide that anyone from rank beginners to seasoned experts can fly this bird.

QUICK SPECS
WINGSPAN: 17.1 in.
WING AREA: 100 sq. in.
LENGTH: 15.5 in.
WEIGHT: 3.2 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $124.99
e-fliterc.com

E-flite Viking Model 12

This great-looking aerobatic biplane goes from box to flight-ready in less than an hour. Once ready, this is the perfect lunchtime flier; you can burn up the sky for about 3 1/2 minutes at full throttle and then, after a quick five-minute charge, you are back in the air. It can do any aerobatic maneuver you know.

QUICK SPECS
WINGSPAN: 22.2 in.
WING AREA: 197 sq. in.
LENGTH: 24.4 in.
WEIGHT: 8.8 oz.
MOTOR: Included
RADIO: 5+ channel
PRICE: $179.99
e-fliterc.com

AEROBATS

PATTERN PILOT TIP

Find a plane/pilot that exemplifies the type and style of aerobatics you like. Copy every detail of the mechanical setup of the plane and the radio programming. Ideally, have them fly your plane to verify that it is set up properly. While aircraft setup is essential, knowing the aircraft is properly set up allows you to focus on your flying skills. *–Dave Lockhart, JR Air Team Manager*

Great Planes Sequence 1.20

There is no shortage of features in this built-up ARF, and the wide choice of power recommendations allows this plane to fit any pilot's skills. Offering a full range of routine patterns, it is easy to improve your level of flying maneuvers. It's an easy plane to assemble over the course of a few evenings.

QUICK SPECS
WINGSPAN: 71.5 in.
WING AREA: 836 sq. in.
LENGTH: 73 in.
WEIGHT: 10 lb. 3.8 oz.
ENGINE: 1.20 2-stroke size
RADIO: 4+ channel
PRICE: $499.98
greatplanes.com

FMS Explorer

Explore precision aerobatics with this forgiving F3A flier with its curvaceous lines ready for gawkers. With the included setup, power is abundant and requires only about an hour of assembly time. Any precision program aerobatic maneuver is doable, and the ability to explore F3A is what this plane is all about.

QUICK SPECS
WINGSPAN: 40.2 in.
WING AREA: 297 sq. in.
LENGTH: 44 in.
WEIGHT: 37.75 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $149.99
diamondhobby.com

F3A PILOT TIP

If this is your first contest, NETWORK! There's nothing that will help you advance faster through the competitive ranks than leveraging the talents of your competitors. RC aerobatics is a small, friendly community that loves to share. Meet the people. That's your true source for learning about setups, trimming, techniques, and advice. Knowing the sources and being able to communicate directly (and doing so) will help tremendously. *–Mark Atwood, Team Airtronics USA Team Captain*

Precision Aerobatics
Addiction XL

This plane has a widespread wing plus plenty of power, and all of this equals some serious fun. We were able to assemble this lightweight aerobat in just a few evenings, and this bird does fly light. Superslow spines, extratight knife-edge loops, backward-traveling elevators, and rolling moves ... need we say more?

QUICK SPECS
WINGSPAN: 59 in.
WING AREA: 1,055 in.
LENGTH: 62.4 in.
WEIGHT: 4.58 lb.
MOTOR: 50-size brushless
RADIO: 6+ channel
PRICE: $325.00
precisionaerobatics.com

Great Planes
Extra 300 SP

There are reasons that Walter Extra's plane is considered world class, and this built-up constructed Great Planes rendition is, too. It is everything you would expect from a top-shelf model. We tried every 3D move that we knew to rip the wings off of this bird, and she took it all. The 300SP is a more capable aircraft than we are as pilots.

QUICK SPECS
WINGSPAN: 50 in.
WING AREA: 478 sq.in.
LENGTH: 47.75 in.
WEIGHT: 58 oz.
MOTOR: Rimfire .32
RADIO: 4+ channel
PRICE: $179.99
greatplanes.com

Aerobeez Extra 330 EPP

If you are looking for an electric model that is different than most things, look no further than this. This EPP foam plane has something to offer everybody, no matter what their skill level. It is easily built in six to eight hours, and when you are done, you have an outstanding performer that is easy to fly and can do just about anything.

QUICK SPECS
WINGSPAN: 48 in.
WING AREA: 496 sq. in.
LENGTH: 48 in.
WEIGHT: 47 oz.
MOTOR: 450-500 watt
RADIO: 4+ channel
PRICE: $139.99
aerobeez.com

IMAC FREESTYLE PILOT TIP

The most important thing is practice. But not just flying: You have to set goals and challenge yourself to get better. Make a list of all of the maneuver variations and orientations that you want to learn and then pick a few off the list every flight and go up high and try them and work on them. As you start getting more comfortable with a move, then start bringing it down in altitude. Once you start mastering orientations and certain moves, then you can start stringing moves together and then you have the basis for real aerobatic flying. *–Kyle Dahl, Team JR*

Aerobeez
Extra 330 SC

For starters, construction is built up, and the plane has a complete hardware package and a great-looking color scheme. Add in everything in the aerobatic-performance handbook and all this bird needs to impress is a pilot with a repertoire of aerobatic skills. You now have a combination that can't be beat and one that any pilot would enjoy.

QUICK SPECS
WINGSPAN: 93 in.
WING AREA: 1662 sq. in.
LENGTH: 93 in.
WEIGHT: 22 lb. 3 oz.
ENGINE: 50cc size
RADIO: 6+ channel
PRICE: $699.00
aerobeez.com

Great Planes
Factor 3D

We feel that intermediate and expert pilots will have a great time on the sticks with this aerobatic performer. It is very light and reactive, so all you really need to do is to tone down the controls for more precision flight and push them up for 3D hucking on the deck. This is one plane that you can keep in the car for some lunchtime fun and excitement.

QUICK SPECS
WINGSPAN: 38 in.
WING AREA: 375 sq. in.
LENGTH: 41.5 in.
WEIGHT: 32 oz.
MOTOR: 10-size brushless
RADIO: 4+ channel
PRICE: $119.98
greatplanes.com

Aeroworks 60cc Freestyle Extra 260 QB-L

Built-up construction with an easy-to-see color scheme, the plane includes just about everything you need to get it in the air. Once there, the plane really performs, and it was capable of any and all maneuvers that we could fly. We were able to easily fly right down on the deck because there is more than enough power to pull out if the need should arise.

QUICK SPECS
WINGSPAN: 91 in.
WING AREA: 1,592 sq. in.
LENGTH: 78 in.
WEIGHT: 21.25 lb.
ENGINE: 50-60cc
RADIO: 4+ channel
PRICE: $699.95
aero-works.net

IMAC PILOT TIP

Here are three steps I recommend:
Objective: Go to a judging school for IMAC, and learn the rules to understand what the judges are looking for.
Discipline: Deliberate control and consistency. This is about how you prepare the plane and practice and for every part of the flight.
Technique: How you perform a maneuver, set up a plane, and the choices of equipment you are using.

Go to a local IMAC judging school, and find some guys in your area that are active and can help you. *–Matt Balazs, Team JR*

IMAC PILOT TIPS

In my many years of flying, my number one tip for fellow pilots has always been proper setup and installation on your model. Making sure everything is secured inside the model and no connectors could possibly come undone; there should be no wire dangling inside the fuselage (especially in the tail). My thing is always if I doubt anything on the plane, then I will redo it. This rule has probably saved many of my models in the long run. *–Kim Quenette, Team Hitec*

Over the years I've been competing, I've found that proper setup is key to having a competitive airplane (center of gravity, servo geometry, mixes, etc.). On average, I spend over 50 flights to truly dial in a plane and get it ready for a contest. *–Santiago Perez, Team JR*

Hangar 9 Inverza 33

This aircraft offers up a new concept for precision aerobatics and 3D flight that you can feel in the sticks. We found it to have a very neutral, forgiving, and an outstanding flight envelope. If you can dream it, this model will perform it, and it only requires a week's worth of evening assembly to complete the build.

QUICK SPECS
WINGSPAN: 75 in.
WING AREA: 1,120 sq. in.
LENGTH: 72 in.
WEIGHT: 12.3 lb.
ENGINE: 30-35cc
RADIO: 6+ channel
PRICE: $499.99
hangar-9.com

Aeroworks 30cc Laser 200

A throwback model that has it all: great looks, excellent quality, and awesome flight performance. We enjoyed the quick-build design of this plane; we only needed one week of evening work to get this bird ready. This plane did all of the aerobatic maneuvers we threw at it, and it did them well.

QUICK SPECS
WINGSPAN: 76 in.
WING AREA: 1,121 sq. in.
LENGTH: 67.5 in.
WEIGHT: 11 lb. 6oz.
ENGINE: 30-35cc
RADIO: 4+ channel
PRICE: $499.99
aero-works.net

AJ Aircraft
Laser 230z

If you are looking for an aircraft that is a perfect combination of precision and maneuverability that will quickly net you a fantastic flight experience, this is it. The built-up model has an easy-to-see color scheme. Low rates equal precision pattern flying; switch to high rates and it becomes a 3D machine, where every showstopping maneuver is possible.

QUICK SPECS
WINGSPAN: 56 in.
WING AREA: 479 sq. in.
LENGTH: 54 in.
WEIGHT: 4 lb. 6oz.
MOTOR: 40-size brushless
RADIO: 4+ channel
PRICE: $249.99
aj-aircraft.com

Premier Aircraft
QQ Extra 300

An EPO aerobat that was generated from the ground up by Quique, it has an extremely robust airframe, installed electronics, and included stabilization system. Beginning 3D pilots and hard-core huckers alike will love this fun-flying foamie, which goes from box to runway in less time than it takes to charge the battery.

QUICK SPECS
WINGSPAN: 47.8 in.
WING AREA: 572.5 sq. in.
LENGTH: 47.8 in.
WEIGHT: 46.7 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $279.99
flexinnovations.com

Flitework Red Bull Edge

This built-up aerobat has one of the nicest-looking color schemes out there. After three evenings of assembly, this plane packs power to perform any aerobatic maneuver your thumbs can input. The Edge is a solid, stable-flying aircraft that any pilot can easily learn a number of new maneuvers with.

QUICK SPECS
WINGSPAN: 66.9 in.
WING AREA: 778 sq. in.
LENGTH: 61.8 in.
WEIGHT: 8 lb. 2 oz.
ENGINE: 1.20 size
RADIO: 4+ channel
PRICE: $399.99
flitework.at

Aerobeez
Slick Pro

The hybrid design implemented in this airframe uses carbon-fiber braces sandwiched to the wood members to help keep strength up and weight down. It is capable of any aerobatic maneuver and makes the pilot look good. Pullout power is excellent, and any of your favorite high-energy maneuvers are totally doable.

QUICK SPECS
WINGSPAN: 70 in.
WING AREA: 981 sq. in.
LENGTH: 66.3 in.
WEIGHT: 159 oz.
MOTOR: 50/60-size brushless
RADIO: 6+ channel
PRICE: $399.99
aerobeez.com

Precision Aerobatics
XR-52

These guys take airframe design seriously, and they do it right! Ease of assembly and high-quality design makes this one of the nicest ARFs out there. Insanely violent tumbles, locked-in harriers and torque rolls, smooth rolling maneuvers, and tight walls and waterfalls are just a few of the many talents this plane possesses.

QUICK SPECS
WINGSPAN: 52 in.
WING AREA: 586.3 sq. in.
LENGTH: 48.94 in.
WEIGHT: 48.65 oz.
MOTOR: 45-size brushless
RADIO: 4+ channel
PRICE: $239.95
precisionaerobatics.com

Aeroworks Yak-55M

We like the outstanding quick build, the all-wood construction, and the great-looking color scheme on this bird. Then there is the flight performance that delivers impressive stability; it easily performed any maneuvers we threw at it. The assembly went without a hitch, and once it is fueled up, it is just a joy to fly.

QUICK SPECS
WINGSPAN: 86 in.
WING AREA: 1,333 sq. in.
LENGTH: 75 in.
WEIGHT: 18 lb.
ENGINE: 50cc
RADIO: 6+ channel
PRICE: $749.95
aero-works.net

Tower Hobbies
Laser 200 Flatty

Here is one of the few aerobats that you can fly indoors or outside. Its foam construction makes this plane extremely light and easy to repair. It can perform any 3D maneuver you can throw at it and can do it in a confined area. We liked the quick assembly, large flight envelope, and compact size.

QUICK SPECS
WINGSPAN: 33 in.
WING AREA: 261 sq. in.
LENGTH: 32 in.
WEIGHT: 6.4 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $39.99
towerhobbies.com

Phoenix Model
Funstar MK2

If you are just starting out in aerobatics, this is the plane you want to start with: a fully capable 3D plane with a very forgiving nature. It is a confidence-inspiring aircraft that is stable and floaty but still begs for you to try new aerobatics. Very little time is needed for assembly, which is good, because flying is what this plane is all about.

QUICK SPECS
WINGSPAN: 58.5 in.
WING AREA: 914 sq. in.
LENGTH: 55.3 in.
WEIGHT: 80 oz.
ENGINE: .46–.52 2-stroke size
RADIO: 4+ channel
PRICE: $139.98
phoenixmodel.com

E-flite Pulse 15e

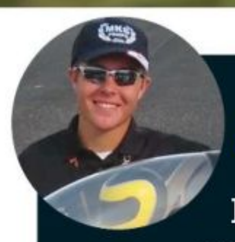
Intended for intermediate and experienced pilots, this EPO foam plane can perform a large array of aerobatic maneuvers. The low part count and damage-resilient foam give the fledgling pilot an aircraft that will continue to fly even through those hard landings that will happen during the learning process.

QUICK SPECS
WINGSPAN: 55 in.
WING AREA: 551 sq. in.
LENGTH: 45.5 in.
WEIGHT: 57.35 oz.
MOTOR: 15-size brushless
RADIO: 4+ channel
PRICE: $239.99
horizonhobby.com

Multiplex Rockstar

A plane that is built for just that all-out, adrenaline-rush acro! Its power-to-weight ratio is awesome, and the large control surfaces offer maximum maneuverability at any airspeed. The Elapor foam makes it easy to assemble in one evening, and the durability of that foam ensures a long-lasting aircraft.

QUICK SPECS
WINGSPAN: 41 in.
WING AREA: 744 sq. in.
LENGTH: 42 in.
WEIGHT: 64 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $399.00
hitecrcd.com



3D PILOT TIP

My advice for someone who is doing his first freestyle contest is to really study the criteria hard. Being very familiar with the criteria will really help you understand how you need to prepare. Also, one of the most important things to remember is that you can only do your best, and that is all anyone can do. Don't put too much pressure on yourself; just have fun, and enjoy the experience. *–Jase Dussia, Team Horizon*

Multiplex StuntMaster

Multiplex again delivers an awesome foam flier that has outstanding engineering and flight performance. Assembly is quick, and the manual is easy to follow. Big fun can be had in the backyard with this plane, which can perform a wide variety of maneuvers with its great power-to-weight ratio.

QUICK SPECS
WINGSPAN: 34.25 in.
WING AREA: 372 sq. in.
LENGTH: 36.5 in.
WEIGHT: 11.25 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $170.00
hitecrcd.com

ALPHA 250-Q RTF FPV

FIRST IN INNOVATION!

mz-12 COPTER Radio

Works with any TRI, QUAD or HEX

1 Install Controller

2 Attach ESC's

3 DONE! GO FLY!

www.graupnerusa.com

Graupner

Diamond
Superroc MXS

If you have to quickly scratch that aerobatic itch, this plane only requires 15 minutes from assembly to flight; needless to say, we like this. Once in the air, rollers are fast; snaps are faster; and pop-tips, walls, and waterfalls can be used to show off the solid structural integrity. We feel that it can give almost any pilot a shot at flying 3D.

QUICK SPECS

WINGSPAN: 43.3 in.
WING AREA: 475.7 sq. in.
LENGTH: 42.5 in.
WEIGHT: 39.45 oz.
MOTOR: Included
RADIO: 4+ channel
PRICE: $180.00
diamondhobby.com

Great Planes
U-Can-Do SF

This plane proved to us that, even with only a basic proficiency, you will progress quickly with this plane at your control. It is an easy and stable flying machine. We only had to put in a few hours of building time before hitting the flying field. You can do and learn just about any aerobatic maneuver on this bird.

QUICK SPECS

WINGSPAN: 59 in.
WING AREA: 912 sq. in.
LENGTH: 58 in.
WEIGHT: 7.25 lb.
ENGINE: .55 2-stroke
RADIO: 4+ channel
PRICE: $199.98
greatplanes.com

Flight Test

BALSA USA

Fokker Triplane

A 1/3-SCALE WORLD WAR I ICON THAT WILL IMPRESS

BY **GERRY YARRISH** PHOTOS BY **GERRY YARRISH & TIM HAGGERTY**

ONE OF MY FAVORITE AIRPLANES is the Fokker Triplane. First seen in action in 1917, the Fokker Dr.I (*Dridecker*) was a demanding aircraft to fly. But because of its superior climbing and turning performance, it soon became a favorite of many World War I German fighter pilots, including Manfred von Richthofen, the famous Red Baron. Although it was one of the most recognized aircraft to come out of the Great War, only 320 were produced, and it had little effect on the outcome of the war.

SPECIFICATIONS

MODEL: 1/3-scale Fokker Dr.I Triplane
MANUFACTURER: Balsa USA
WINGSPAN: 94 in.
WING AREA: 3,260 sq. in.
WEIGHT: 35 lb.
WING LOADING: 24.74 oz./sq. ft.
LENGTH: 74.5 in.
RADIO REQ'D: 4 to 6 channels
POWER REQ'D: 40cc to 60cc gas/2.4ci to 3.7ci glow
PRICE: $549.95

GEAR USED

RADIO: Spektrum DX18 w/ two 9-channel AR9020 receivers (spektrumrc.com); six ProTek RC 330T servos (amainhobbies.com); NoBS 2300mAh A123 receiver battery (hangtimes.com)
ENGINE: Zenoah GT80 (horizonhobby.com) w/ Slimline twin-set smoke mufflers (chiefaircraft.com); Sullivan 24-ounce fuel and smoke tanks and SkyWriter smoke pump (sullivanproducts.com)
PROPELLER: Falcon 26x8 (falconpropellers.com)

HIGHLIGHTS

- Excellent flight performance
- Strong construction
- Clear, easy-to-read plans

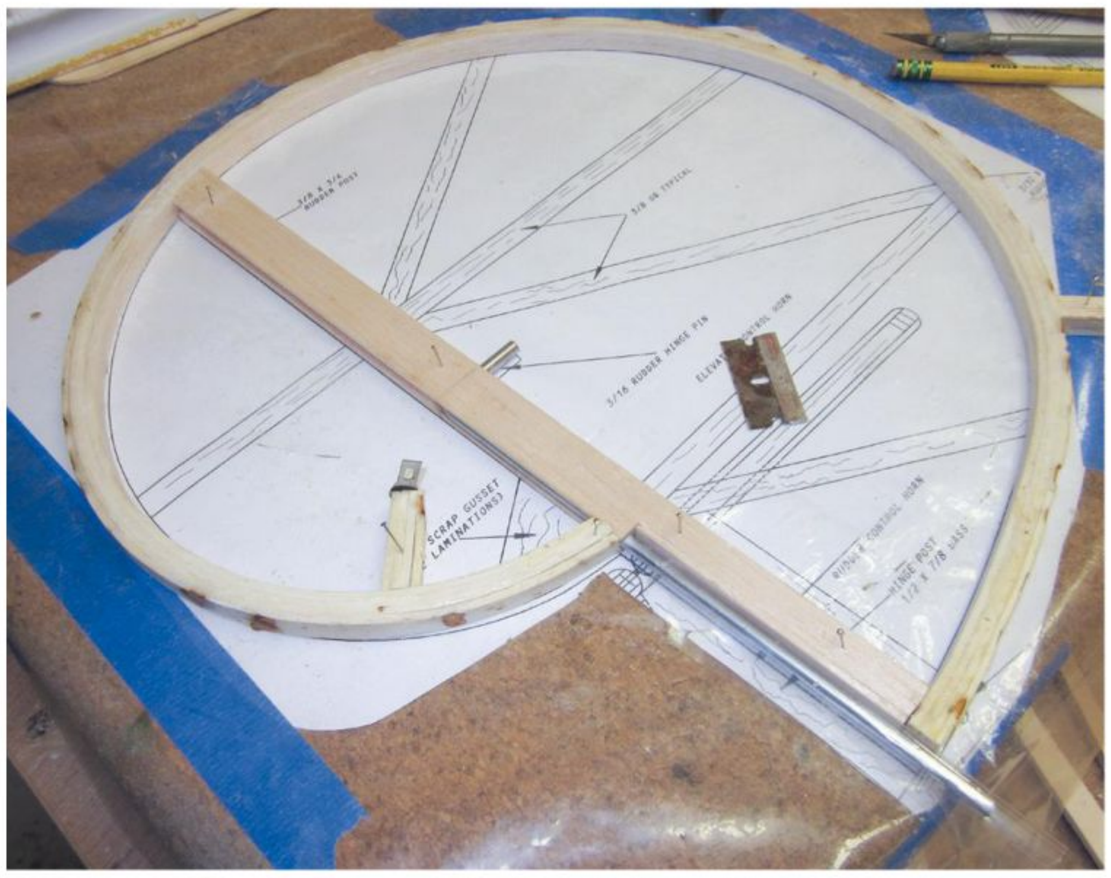
I've built several RC triplanes and my latest, the Balsa USA 1/3-scale version, is one of the best performers that I have ever flown. The 33% Triplane is impressive and also pilot-friendly. Even when the wind starts to kick up, it can easily handle gusty conditions.

UNIQUE FEATURES

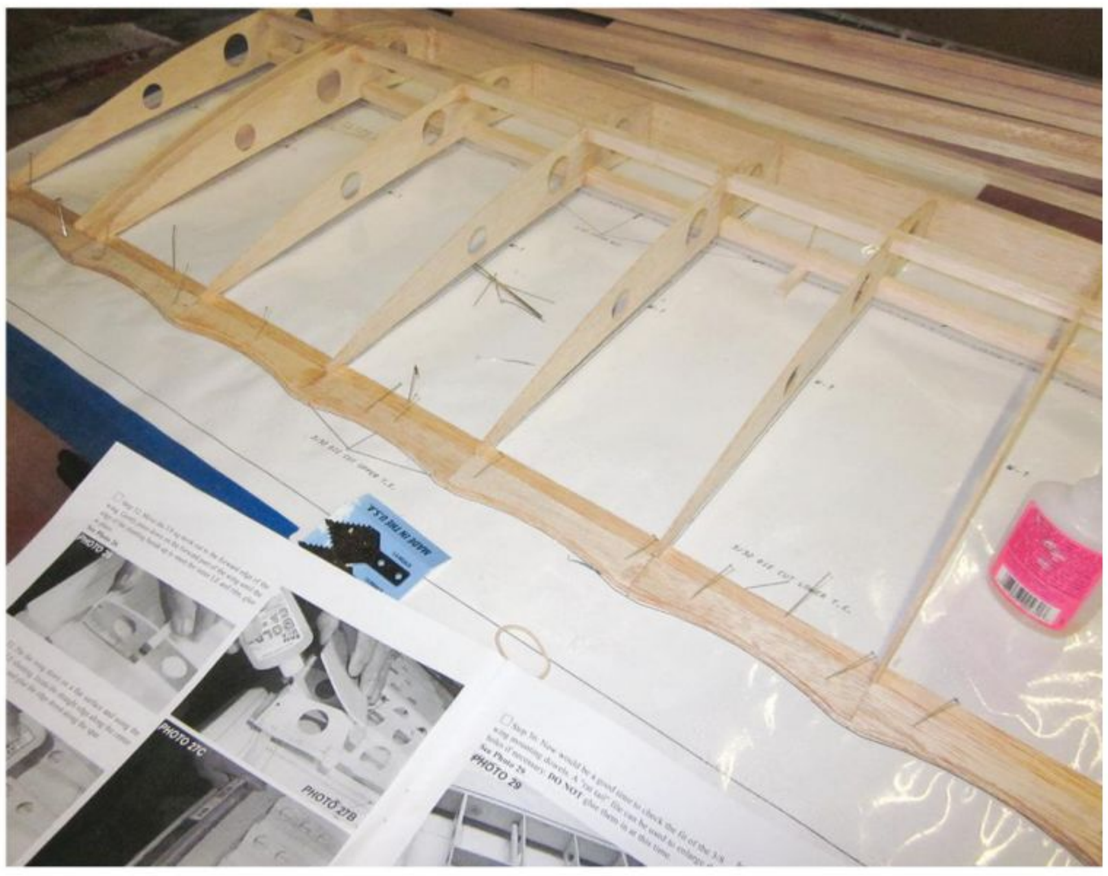
To get me in the mood, I like to start most projects by first assembling the tail surfaces, then I move on to the larger parts. The rudder has a laminated outline formed out of balsa strips that you soak in hot water, then wrap around an included form. The horizontal stabilizer and the elevators are also assembled flat over the plans. The elevator tips are formed out of laminated balsa strips, as well.

The fuselage is a simple box structure with light-ply doublers at the forward sides and top and long square balsa longerons, verticals, and diagonals forming the aft fuselage. The sides are assembled flat over the plans. Once you have the two sides built, you assemble them vertically (upside-down) and add the crosspieces using the fuselage top view as a guide.

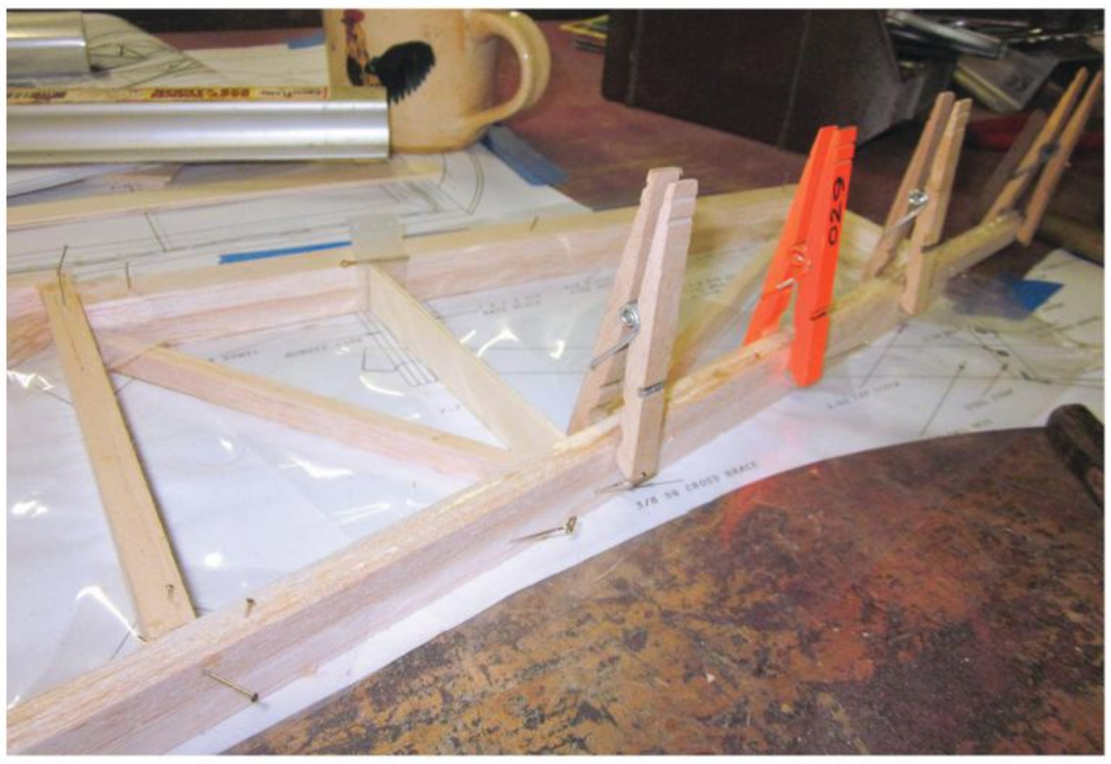
Placement of the plywood firewall requires having your engine available. I chose the Zenoah GT80 twin-cylinder engine, and it fits nicely without having to cut into the forward vertical members. For additional strength, wide balsa tri-stock is used to support the firewall all around.



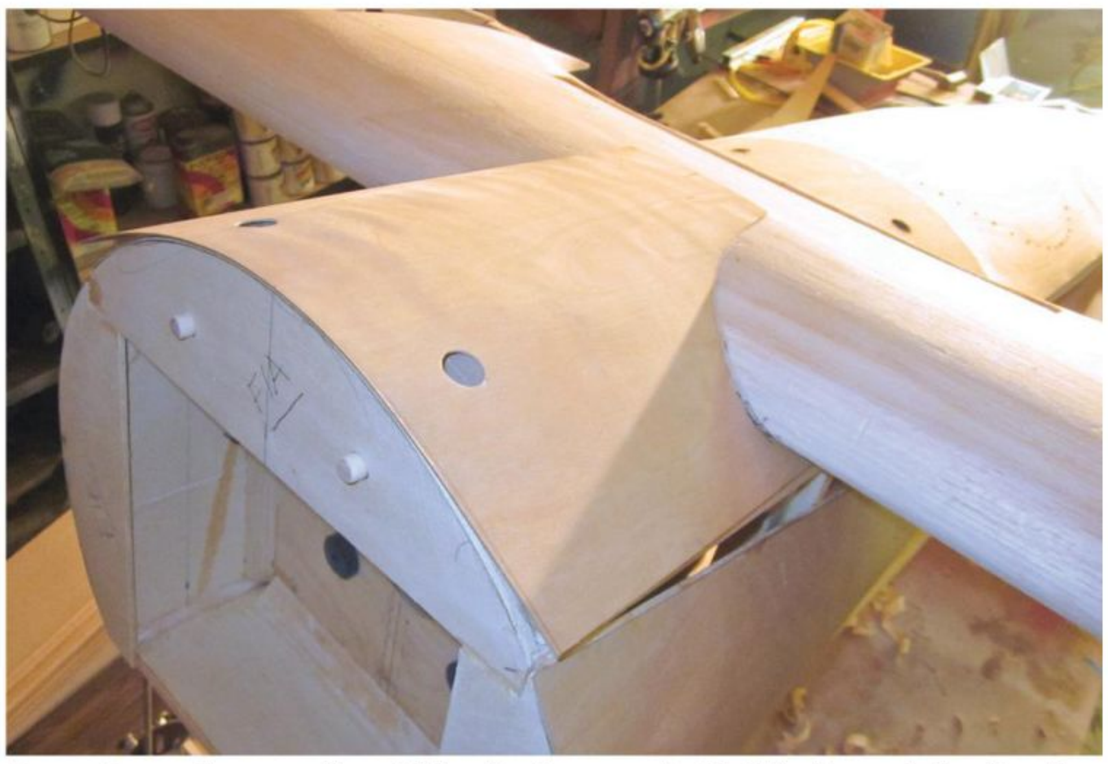
The comma-shaped rudder uses a laminated balsa outline. It is formed around an included former from the kit.



All the wings use the same basic building technique. Note that the ribs are all undercambered.



The fuselage sides are built flat over the plans. The second side is built over the first one to make sure that they are the same size and shape.



The center section over the middle wing is covered with thin plywood sheeting. It extends from the firewall aft past the cockpit opening.

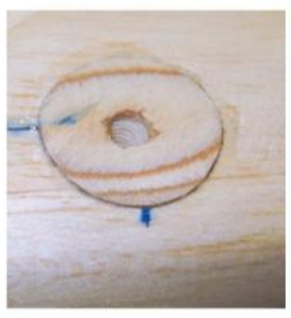
THE WINGS AND STRUTS

Before tackling the wings, you have to form the six curved and laminated wingtips. The plans show using blocks glued to an assembly board, but I've found that cutting a 3/4-inch pine board to shape and then clamping the layers of balsa to it was much quicker and easier to do.

All three of the wings are built flat on the building board and have no dihedral. They are all roughly the same, incorporating sheeted leading edges with D-tube construction. The trailing edge is formed with wide bottom sheeting and a narrower top strip glued in place, then sanded to blend into the ribs. Each wing has two main spars with vertical-grain balsa shear webbing and undercambered ribs. All the ribs have capstrips.

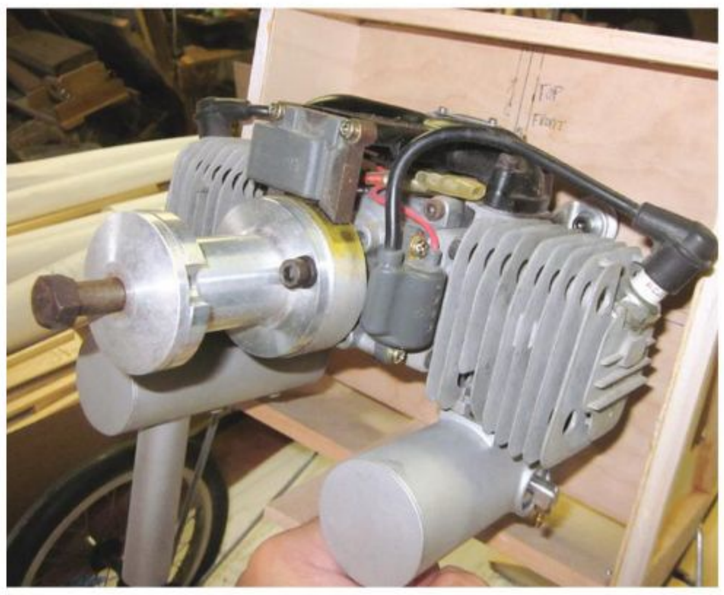
The top wing is the largest, and it is a little more involved as it has ailerons. The servo-installation method is left up to the builder, so I made flush servo hatches with the output arms protruding downward through slots. I glued the frames between the ribs and screwed the hatch covers in place. The ailerons are top hinged with giant-scale Du-Bro flat hinges. I used Robart ball-link control horns on all the control surfaces. I use Zap glue for most of the construction.

To make the cabane struts, the plans show an alignment jig to support the top wing. Using the jig, you install the music-wire strut pieces and

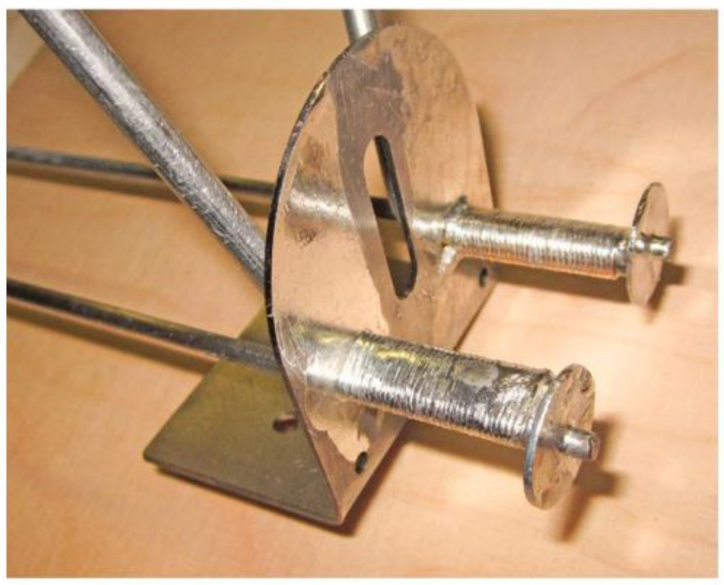


Above: **I added these plywood discs around the wing-attachment screw holes. This prevents the screw head from damaging the wing sheeting.**

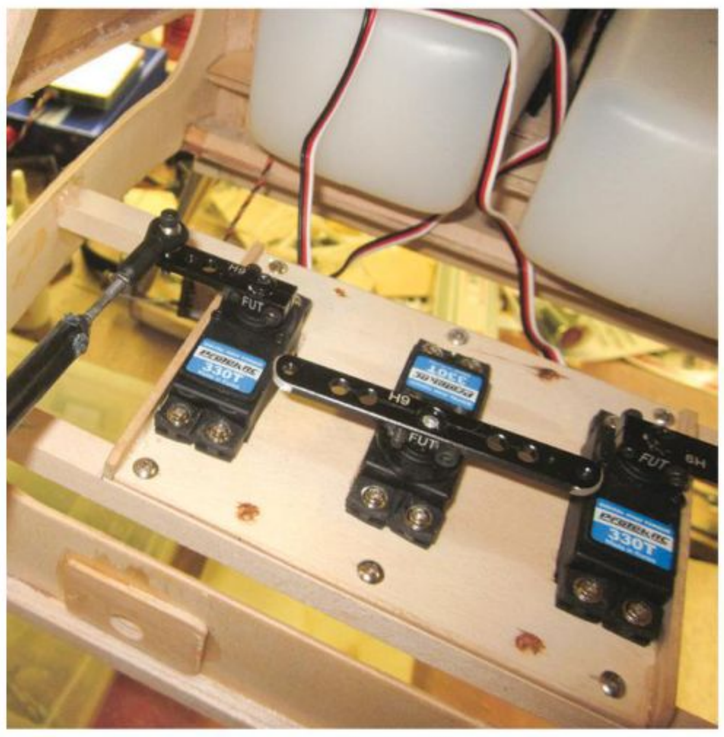
Left: **After all three wings are attached to the model, then the interplane struts are fitted into place. You measure the spacing and alignment, then install the attachment screws.**



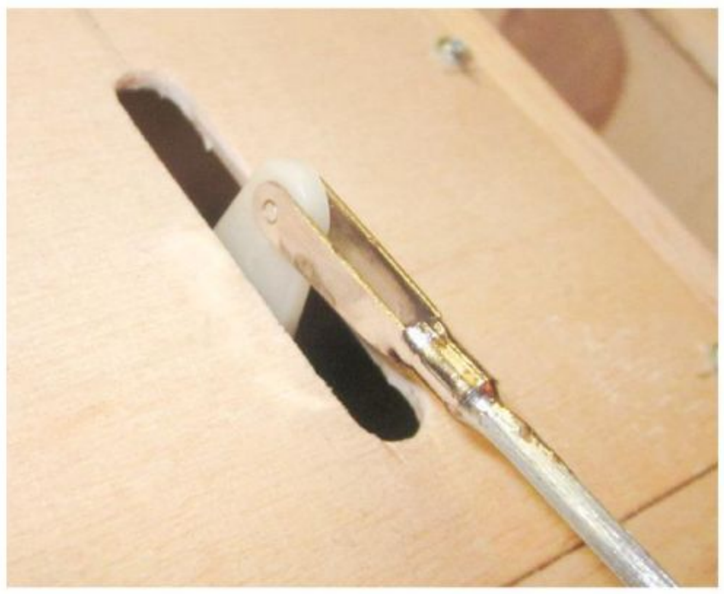
Here the Zenoah GT80 (along with the firewall) is being fitted into place.



The landing gear is made out of formed music wire and soldered together. Here, you see the bottom attachment bracket and the ends of the wires all soldered together. The axle is attached with bungee shock cord.



The servo installation is left up to the builder. I made a simple plywood servo tray placed behind the fuel and smoke oil tanks.



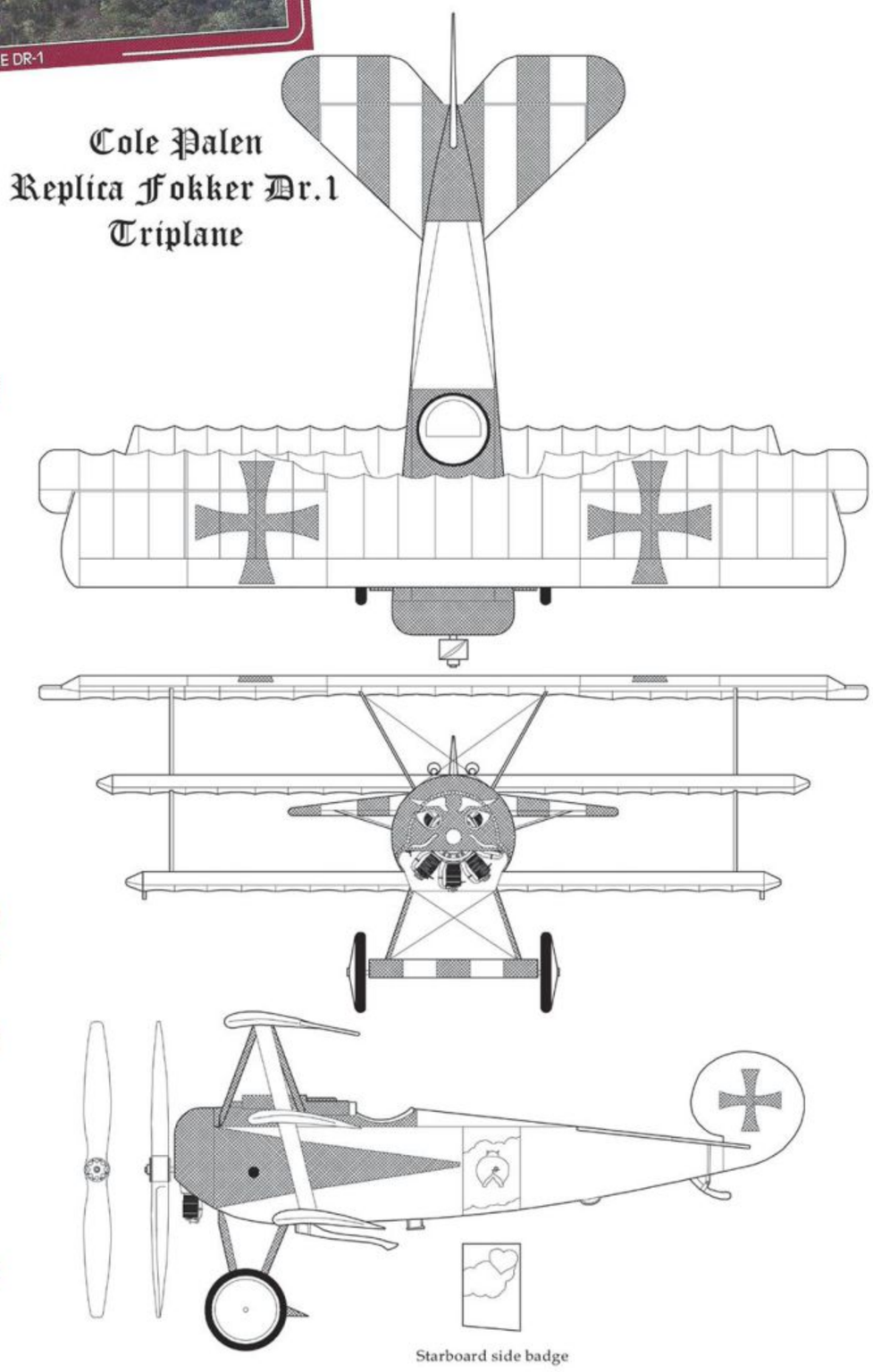
This is the aileron servo hatch and control linkage in the top wing.

Left: This old Old Rhinebeck Aerodrome postcard shows off the version modeled by the author.

Below: This scale three-view drawing shows the 1967 markings of the full-size Cole Palen Triplane.

The Bloody Black Baron's Triplane

Next to the infamous Manfred von Richthofen, one of the most widely known and beloved characters to ever fly a Fokker Triplane was Cole Palen, aka "The Bloody Black Baron of Rhinebeck." The very heartbeat of the Old Rhinebeck Aerodrome in Rhinebeck, New York, Cole flew his replica Fokker Dr.I Triplane to thrill audiences for decades. Cole's Triplane was a real workhorse and saw plenty of wear and tear. It had been repaired and recovered numerous times, and so there were a few versions of the Black Baron's first Triplane. I chose to model Cole's 1967-era version, which is most readily identified by its fuselage markings, overall red paint job, and two uncovered spoked wheels.



The author and his big Triplane at the Old Rhinebeck Aerodrome WW I Jamboree.

For more details on building the Triplane, go to ModelAirplaneNews.com/triplanebuild.

Bombs away! Just like Cole Palen did with his full-size Triplane. I used an E-flite release unit to drop the bomb. It works great.

solder the wing-attachment straps in place. The outer interplane struts are made out of 1/4-inch bass wood. Each is one piece and goes through all three wings, being secured with several 4-40 cap-head machine screws and blind nuts.

FINISH AND FINAL ASSEMBLY

I used Stits Lite fabric (stits.com) and Poly-Tone paint (which is gasoline fuel proof) to cover and finish the Triplane. The fabric is glued to the structures with Poly-Tak, and the cloth is shrunk tight with a covering iron. I used an HVLP (high-volume, low-pressure) spray gun to apply the paint, which dries very quickly. The cowl and wheels are from Arizona Model Aircrafters (arizonamodels.com).

IN THE AIR

For easy access, I installed the choke linkage so that it exits the model between the two machine guns. Once the GT80 was running, I let it warm up a bit before advancing the throttle. On the ground, the Triplane has very little tendency to nose over, but with its fixed tailskid, some down-elevator is needed to help move the tail around in turns.

Stability: With no dihedral, the big Triplane is neutrally stable and is easy to fly. I use high rate settings for ailerons to increase roll rate and low rates on the elevator and rudder.

Tracking: With its free-flying rudder (no vertical fin), the model tracks well, although there is a very slight left and right wiggle similar to the full-size airplane. In turns, this is not an issue. Rudder response is very positive.

Aerobatics: Aggressive maneuvers are what the full-size Triplane was designed for. The Red Baron often said, "The Dr.I can climb like a monkey and turn like the devil!" The GT80 provides all the power that you'll need. Loops are easily done from level flight, and turnaround maneuvers, such as wingovers, half Cuban-8s, split-8s, and Immelmann turns, are all easily accomplished. Be aware, though, of your throttle setting. The Triplane can really pick up speed on the way down.

Stall and Glide Performance: Don't try to stretch approaches without adding power. Those three wings and the smaller subwing between the wheels produce both a lot of lift and a lot of drag. With the throttle pulled back, the stall break is obvious, and getting into and out of spins is pretty easy with rudder and throttle inputs.

For landing, use about one-third power and let the model come in with the nose slightly down. Then, when over the end of the runway, slowly bring the throttle to just above idle while holding in up-elevator. Wheel landings are the only way to go. Three-pointers usually end with a sudden bounce or two.

PILOT DEBRIEFING

Inspired by Cole Palen of the Old Rhinebeck Aerodrome, I try to fly my Triplane with purpose. I trim the model for straight and level at just above half throttle. This way, the model easily climbs by advancing the throttle, and it starts to descend by reducing the power. The model is not a demanding flier. Dropping bombs and then making low-level, high-speed passes and aerobatic moves with smoke on just seems natural.

BOTTOM LINE

I spent about 500 hours over a 10-month period to build, cover, paint, and fit out the big Triplane. Construction is typical for all Balsa USA kits. Although it is not a beginner's project, there's nothing tricky about it. If you want to impress, the 1/3-scale Fokker Triplane is the plane for you!

DROPPING BOMBS AND THEN MAKING LOW-LEVEL, HIGH-SPEED PASSES AND AEROBATIC MOVES WITH SMOKE ON JUST SEEMS NATURAL.

www.align.com.tw

www.align.com.tw

www.align.com.tw

www.align.com.tw

3D
BRUSHLESS MOTORS

TREX 150 DFC

3D Indoor / Extreme Outdoor

DFC
TREX 250 PLUS

DOMINATOR
TREX 450L

DFC
TREX 450 PLUS

Check for more Align T-REX helicopters from Align world distributors.
http://www.align.com.tw/distributors-en/

ALIGN 亞拓電器股份有限公司
ALIGN CORPORATION LIMITED

Tom Smith flew his old reliable A-1 Skyraider at the event. A veteran in every sense of the word, Tom's "Sandy" was an accurate representation of a Vietnam-era combat machine.

Twelve O'clock High

A great scale fly-in with something for everyone!

TEXT AND PHOTOS BY **RICH URAVITCH**

Boy, this is some great hobby, isn't it? It always amazes me, attending the number of events that I do, just how much talent is possessed by those involved in RC. From design and fabrication right up to flying, you'd be hard-pressed to find another pastime that requires as broad a range of skills as RC. Even considering the overshadowing of the traditional "building" phase by the now-prevalent ARF (almost-ready-to-fly) models, the general outlook for our hobby looks fairly healthy. And if you want clear evidence of it, all you need to do to be convinced is to attend an event such as Twelve O'clock High.

Event promoter Frank Tiano (right) provides restraint for Sean Curry's 1/5-scale Hawker Tempest. This great-looking model spans 97 inches and uses a ZDZ 90 for power.

Above left: **The excellent F6F Hellcat from Mike Haspas performs one of those passes for the judges/photographers. The big model flew extremely well and sounded great!**
Above right: **Navy Reserve color scheme on this F9F-6 Cougar is a nice change from the more-often-seen dark blue. Shani Studnik waits his turn to fire up.**
Below: **Here's a really neat electric Heinkel He 100, built and flown by Lenny Stanko, from enlarged Ziroli plans, with E-flite Power 60 on 6S.**

THE EVENT

Like the other three events presented by Frank Tiano (Top Gun, Florida Jets, and Red Flag), Twelve O'clock High takes place at Paradise Field, a great flying site located on Lakeland Linder Regional Airport in Lakeland, Florida. All of these events are spread out across the calendar to take advantage of some of the best flying weather available. So what can be considered typical or representative of both the type of model and the event? First of all, quality. Some planes at this year's event were scratch-built, and many were done from kits, including those that came from highly prefabricated, often composite structure, kits, which continue to amaze us. Let there be no doubt that very few of the models on hand were in the ARF tradition as we've come to know it. Clearly, the guys participating in this event realize that their chosen type of model demanded some extraordinary attention to detail, and it showed.

The second element of the event is the very noticeable willingness of everyone to openly exchange information with others on materials, techniques, and sources. Even if you are not a

Sponsors

PRIMARY:

Horizon Hobby

Model Airplane News

ASSOCIATE:

Aircraft Modeler's Research

Authentic Scale

Bold Props

Frank Tiano Enterprises

Spektrum

Zap

The F4U-7 Corsair of Tom Czikk is caught at the moment of tank release. It's nicely finished in French Navy markings used in the 1956 Suez conflict. The invasion stripes are the correct yellow and black colors!

participant, you can consider this event an outdoor, multiday seminar on big, bigger, and biggest RC airplanes. Not that all RCers don't do the same thing; there just seems to be more of it in evidence here. They seem anxious for their numbers to grow, and it sure appears to be working. As you might expect, most of the models being flown were scale types, replicating full-size warbirds, jets, civilian aerobatic, and even commercial subjects—something for everyone! Although not a competition, participants were eligible for special awards; check out ModelAirplaneNews.com/12Oclock for a complete list. It has been said that interest in scratch building is dying and prefabrication is the way of the future. With this in mind, I decided to take a close look at the subjects on hand to get some feel for the truth in this widely held opinion.

Herky Bird Twins!

What's the likelihood of two giant C-130 models, with nearly identical markings, showing up at the same meet? Not only that, they were both scratch-built using different techniques and materials! The first, from RC scale veteran Skip Mast, was 1/12 scale with a 132-inch span and mostly carved out of foam. It was featured in MAN years ago as a construction article, and plans are available from the Air Age Store. For this event, flying chores were handed over to another long-standing scale guy: Tom Czikk. The other C-130 builder, Bob Munich, with his pilot, Marvin Alvarez, rounded out the happy quartet. This Hercules was slightly larger than Skip's with a span of 149 inches, making it 1/10 scale. The real crowd-pleaser came with the formation flight of the two models with repeated low-level passes down the runway, simulating the SAR mission of the Coast Guard-marked models. The formation, close-proximity taxi back looked really great, and the guys lined up the models to give their thumbs up to both the event and their demonstration. Skip received the Critic's Choice Runner-up award for his great C-130.

Builders and fliers of the twin C-130s express their feelings after a great formation demo.

STANDOUTS

One of my long-time favorites was Tom Smith's 1/6-scale, 101-inch, Douglas A-1 Skyraider built from the Nick Ziroli plan. This all-wood model has been around for years and still looks great, and Tom's flights keep getting better. He is clearly comfortable with the big model. The Southeast Asia–camo scheme, subtly weathered like only a combat veteran can get, was convincing and well done. Correct-appearing weathering is tough to accomplish as the tendency to overdo it is what is frequently seen. But Tom nailed it!

While on the subject of finishes, the other extreme was represented by the Macchi MC.200 Saetta of event promoter Frank Tiano. This subject is not often modeled, and after watching it fly, it's hard to understand why. It is a cruiser that is smooth, precise, and well mannered. Back to that finish—this is a traditional fiberglass-over-balsa construction, which then is painted and accurate markings applied. With this project, there was no paint in the mold, touch up the seams, install the equipment, stick on the markings, and go fly. Frank and his crew started with a set of plans from MAN, scaled them to suit his requirements, did some re-engineering, cut down some balsa trees, and started building.

Built from enlarged *Model Airplane News* plans, Frank Tiano's Macchi 200 was unique and flew well.

Eduardo and Ana Estevez can always be counted on to bring something really neat to these events. This is their BVM/Skymaster Cougar with a KingTech 180 turbine. What a striking color scheme!

Tatsuo Sugiya, "Sugi" to his many friends, had his 70-inch Ziroli P-47 finished in Fourth Fighter Group markings. A tough scheme to duplicate accurately, his appeared spot on!

Some great demo flights were logged by Art Mangarino with his 1/2-scale Decathlon. He was ably assisted by his three-person "pit crew"!

Fio's Tomcat

Bob Fiorenze, a name known to most scale fans (jet modelers in particular), brought his F-14A Tomcat, done up in the Navy VX-4 Playboy scheme. Built from the vintage Yellow Aircraft kit, this model is, according to Bob, "one of the most challenging and complex models" that he has ever undertaken. Some of you might recall that Bob flew the original with internal-combustion ducted-fan units, back when piped OS .91 VR-DF and Dynamax fans were the hot setup. My, how things have changed! Today's version sports twin turbines and retains the swing-wing and aileron features of the original. Bob also told us that this model's incredible all-black finish was accomplished with spray paint from rattle cans! Those of you who say that you can't spray-paint due to lack of sophisticated spray equipment need to find a new excuse; this thing looked amazing! Equally amazing was the model in flight, when Bob swept the wings from fully extended to retracted, making the model look like an arrowhead, all accomplished via the amazing machined mechanics shown in the photos. He received the Best Jet award for his efforts.

Right: A Zenoah GT-80 gas engine provides the motivation for Sam Parfitt's Douglas SBD Dauntless. The faded color scheme looked just right.

Below: The big 1/3-scale Paulhistina brought by Rogerio Araujo uses a Zenoah G62 to get its 40 pounds easily into the air. The 14-footer handled just like the real one, with sideslipped approaches and gentle aerobatic maneuvers.

While I heard someone refer to the color scheme as a "flying giraffe," it is living proof that camo and wartime schemes are far more difficult to do accurately than the more frequently seen monochrome or two-tone finishes.

There were many other excellent projects on hand, not the least of which was the Paulhistina by Brazilian modeler Rogerio Araujo. This Cub-clone machine is 1/3 scale, (that's 13 feet of wing!), Zenoah G62 gas powered, well finished, and nicely detailed. Rogerio let Dino DiGiorgio fly it throughout the meet,

and the model did, indeed, look like a full-scale airshow performer with the full range of Cub-style aerobatic maneuvers, including some of the prettiest slipped landings that only "rag"-covered classic tail-draggers can do!

World War II fighters generally conjure up the image of lithe, svelte, slim, trim machines with gobs of horsepower, like the P-51 Mustang or Bf 109. Rename the category Fighter Bomber and a whole new group gets in line. The brutish and classic P-47 Thunderbolt readily comes to mind. What also should come to mind is the Hawker Typhoon/Tempest series. These were rugged, highly regarded members of the Royal Air Force lineup in WW II. Capturing both the flavor and presence of the type, Sean Curry brought out his excellent 1/5-scale Tempest from the Roy Vaillancourt plan. Now, this is a moose of an airplane, but it flies extremely well in spite of its 49-pound flying weight, easily handled

CHIEF Aircraft

www.chiefaircraft.com
Orders: 1-877-219-4489
models@chiefaircraft.com
jetshop@chiefaircraft.com

Skymaster unarguably develops the finest turbine products in the world.

PRO ARF Plus:
Larger scale, higher performance sport & scale airframes. Be the envy of the field!

X-treme ARF Plus:
Includes nearly everything a jet owner would need to fly.

Exclusively Through Chief
1:3.75 BAE Hawk T-1/100
Call for Airframe and Turbine Combos

1/5th F-16 Falcon
Multiple Schemes
In Stock and On Order

Pilatus PC-21
Turboprop

SkymasterUSA

Mufflers, Header and Canisters

Jet-Tronics
Air Valves & Sequencers

Fuel System
Components & Fittings
In Stock

Duralite Batteries
A123, Li-Ion and LiFe

DA

MVVS since 1953

DLE

Call for Pricing and ARF Turbine Combos

Jet Central Behotec JetCat Models In Stock!

GoPro
In Stock
- HERO3+
- HERO4
- HERO+
- Session

YUNEEC Q500
w/4K Camera

PHANTOM 3
RTF 4K Quad

- Lowest Prices
- Biggest Selection

Fixed Wing Gyros
iGyro & iGyro 3e
iGyro 1e (Single-Axis)
Cortex 3-Axis System
In Stock!

PowerBox Systems

JR SPEKTRUM Futaba

2.4 GHz Receivers
In Stock

Servos
JR, HITEC,
MKS, SAVOX
Lowest Prices
In Stock
Call for Multi-Servo
Package Pricing

Pilot

The Best Built Balsa Airframes on the Planet!

EDGE 540

EXTRA 330SC

YAK 54
Most Schemes & Models In Stock

- Strong & Lightweight
- Professional Design
- Landing Gear Included
- Hardware Included
- Carbon Fiber Accessories
- Covered in Oracover (Ultracote)
- High Pre-Installation

DECATHLON

Dolphin Jet

100-140N Trainer
In Stock

Available in ARF & Turbine Ready

KRILL

EXTRA 330SC

IN STOCK
AVANTI S
2.1m Composite
3D Sport Jet

HANGAR 9

P3 REVOLUTION
60CC ARF

Above left: A Meister Scale kit provided the basis for this Bf 109G model which was expertly flown by Dino DiGiorgio. Despite its large size, it was amazingly nimble and had great slow-speed qualities.

Above right: Top Gun competitor Rich Feroldi applies the "Armstrong" starting system to his beautiful Albatros. Rich confided that the model is an oldie but a goodie, having been first seen at Top Gun in 1996!

by the ZDZ 90 engine. Sean received the Best Craftsmanship award and told me later that he has still more planned for surface detailing, which he wants to accomplish before the Top Gun Invitational.

Best WW II award went to Scott Prossen for his gorgeous F4F Wildcat. If you read *any* of the modeling publications, you might be familiar with the model. Pictures simply don't do it justice. The metal-clad finish is weathered perfectly, the big Moki radial lends the sound that only Mokis make, and the scale retracts are literally works of art. The big 'Cat is true 1/4 scale and started as a European Limited Edition kit from Fisher.

There was tons of other eye candy on hand, each with something special to offer. It made no difference what your preference was because at least one representative of the event's period was there: biplanes, monoplanes, and early-era jets from WW I and WW II to Vietnam. This three-day get-together should be on your "don't miss" list for 2016. It has something for every fan of period RC models: a great site, terrific weather, on-site vendor support, and a group of guys that are just fun to be around! Mark your calendar now. Upcoming events at Paradise Field include Florida Jets, Top Gun Invitational 2016, and the newly announced Red Flag jet-flying event. You won't be disappointed!

Surface Area Becomes Wing Area!

One of the really interesting projects to be seen was the scratch-built Vought V-173 "Flying Pancake," designed, built, and flown by Tom White. The full-scale original was built in 1939 as a proof-of-concept vehicle, which flew remarkably well on its two Continental 80hp engines. Its 23-foot span generated lots of lift, which proved the idea valid enough to pursue and a contract was let for a larger, more powerful version, which never flew. The prototype was retired in 1947; it was subsequently restored and is now on display in the Frontiers of Flight Museum in Dallas, Texas. Tom's model is 1/7 scale, yielding a 78-inch span, and is powered by a pair of Scorpion motors easily hauling its 15 pounds around. Apparently, Tom was successful in replicating the flying qualities of the full scale; I watched it take off in about three feet, cruise around smartly, nearly hover, and complete its flight with a helicopter-type landing, rolling out less than 10 feet! It was very impressive. The judges must have thought so, too, as Tom was the recipient of one of the Special Recognition awards.

Flying Tiger FMS 1400MM P-40B

PNP $359.99

Feature

- √ New EPO Foam Technology, Lighter yet stronger for better flying weight.
- √ Retractable main and rear landing gear.
- √ Full scale split flap.
- √ Ball Link connectors on all control surface connections.
- √ Newly designed servo box for ease of adjustment of servo arms.
- √ New removable sliding battery tray.
- √ New 4258 KV 650 Motor, 17g Metal Gear Digital servos, 70A ESC.
- √ Metal shock absorbing struts with scale size big wheel.

Additional items include when you pre-order

1. US$10 off directly.
2. A free propeller.
3. A free FMS airplane cover.
4. A free FMS cap (summer version).
5. A free souvenir--Blood chit.
6. A free limited edition of Flying Tiger T-Shirt. (5XL by default. Contact sales if you need different)
7. Two free limited edition of Flying Tiger bracelets.
8. 10% chance of receiving a free Predator 4S2600/35C battery. (We will be randomly placing batteries in the boxes at the factory.)

FMS Butterfly 400mm of indoor fun

A new creative design from FMS is coming. With it ultra-light weight (less than 1oz) and speed, the Butterfly is great for flying indoors. On a calm day you can even fly outdoors.

Everything you need is included in the box. Install the included AA battery in the transmitter, charge the airplane battery. You are now ready to enjoy RC indoor flying.

The FMS Butterfly maintains our consistent attention to detail and product standards, high quality and yet delicacy the Butterfly is reasonably priced and is a definite gift for the veteran or beginner alike.

RTF $ 99.99

Specification

Wingspan	400mm
Overall Length	352mm
Flying Weight	37g
Motor Size	0716 Coreless Motor
ESC	3A
Servo	Linear
Radio	4 Channel
CG (center of gravity)	About 33mm (From Leading Edge)
Prop Size	100mm
Recommended Battery	3.7V 180mAh Lithium Polymer Battery

3D aerobatic 1100mm MXS

Introducing the all New 1100mm MXS 3D aerobatic plane from FMS Models. Designed for the Intermediate to advanced 3D pilot & Built specifically for 3D Flight, the MSX is sure to please even the most capable of 3D pilots.

Painted in Bright Yellow and Black, The New MXS is sure to get attention at the flying field... Easy to assemble, built tough, & 3D ready.... Look no further than the New MXS from FMS Models!

PNP $ 199.99

Specification

Wingspan	1100mm /43.3in
Overall Length	1080mm /42.5in
Flying Weight	1050g /37.1oz
Motor Size	3536-KV1250
ESC	40A
Servo	9g digital metal gear x 4
Radio	4 Channel
CG (center of gravity)	70-80mm (From Leading Edge)
Prop Size	11*5.5 2 blade propeller
Recommended Battery	Li-Po 11.1V 2200mAh 35C

sales@diamondhobby.com CALL: 850-765-1132

DIAMOND HOBBY
diamondhobby.com

DiamondHobby LLC.553 Capital Circle SW Unit 4
Tallahassee FL 32304

Flight Test

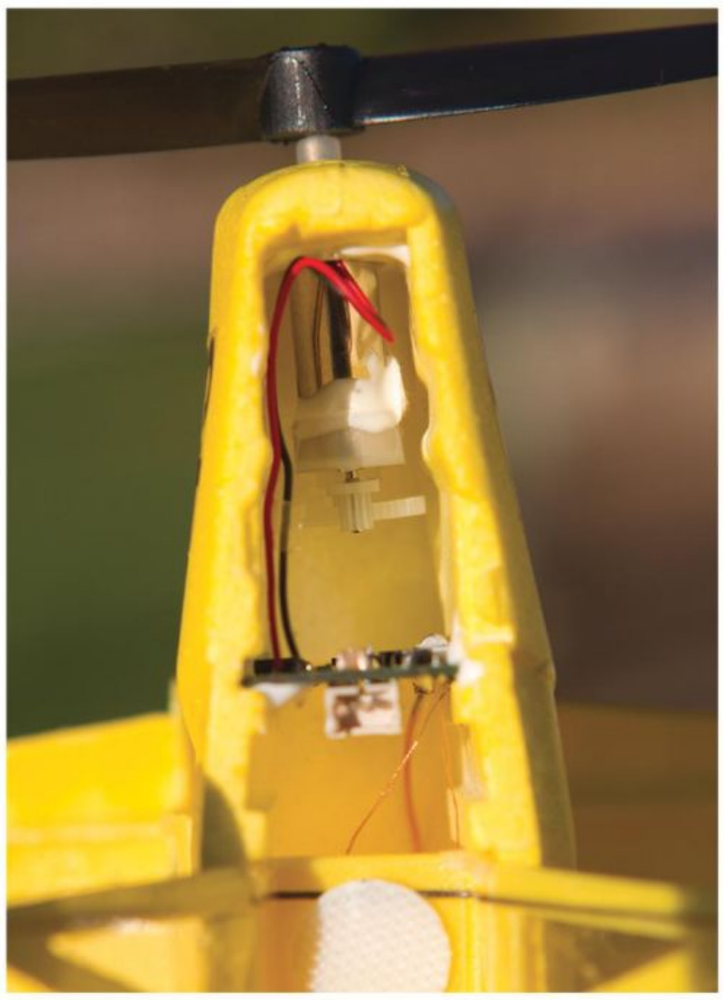
HOBBY PEOPLE

Micro Tiger Moth

THIS FRONT-YARD FLIER IS READY TO CARVE UP THE SKY

BY **CHRIS BARRETT** PHOTOS BY **JOHN REID**

HOBBY PEOPLE INTRODUCED A FRONT-YARD FLIER in the shape of the Micro Super Cub a little over a year ago. It caught my attention as a simple, fun plane to play with indoors. I had a blast trying to fly it in tighter and tighter locations and ended up racing it around inside for the majority of the time. I flew it at home, at work, and just about anywhere I could give it a little toss. So when I saw Hobby People come out with the Tiger Moth as the next plane in their front-yard line, I couldn't wait to check it out.



Not much space in this fuselage, but don't worry, everything you need fits in there.

This prop is small, but it has plenty of pull for this little Tiger Moth.

The Micro Tiger Moth follows the same outline as the Super Cub: It comes completely built, with no assembly required. It is ready to fly when you install four AA batteries in the transmitter and charge the included LiPo battery. The transmitter looks identical to the Super Cub model, and the whole shebang is packaged neatly in a small box. The plane is constructed out of foam, and an extra prop is also provided in the kit. There is a little detail work in the foam and some stickers to finish off the overall appearance. This is labeled as a beginner plane, but again, don't let that fool you about how much fun you can have with it.

UNIQUE FEATURES

The first thing that I noticed when unpacking this plane was how much cleaner the overall appearance was compared to the older model. The tiny delicate wires that I was afraid would snag and rip out had been tightened and taped down in more locations. The control surfaces were taped a little better, and the magnetic actuators were attached more securely. Everything was nice and tidy, and nothing looked out of place.

The proportional magnetic actuators on this Tiger Moth worked well, too; they were smooth and required no trim adjustment right out of the box. The control surfaces were perfectly straight, and the plane flew as such. You literally just install the batteries and it is ready to fly.

The included 2.4GHz transmitter looks identical to the one that came with the Super Cub, but it has smoother controls that translate a little more directly to how you expect the plane to fly. It still has a LiPo charger built in, along with the little compartment to keep the battery in. The red and green LED lights let you know if the battery is charging and what is going on with the transmitter. The digital trim buttons are also there if you need them, but I never found the need to touch them, even after several flights.

The 1S 35mAh battery takes about 30 minutes to charge fully using the transmitter and gives you about five minutes of flight time. It fluctuates depending on how you fly, usually a little more than five minutes but rarely less than that. The micro gear-drive power system provides just the right amount of power: plenty to climb and get the plane to do what you want but not so much power that would make the plane hard to control.

IN THE AIR

This Tiger Moth is just a little fellow, so you don't need a whole lot of space to get it airborne. It is a front-yard flier through and through. For hand launching, 3/4 to full throttle and a very light toss is all it takes to get it flying. For ground takeoffs, find a smooth surface and full throttle will have it up quickly. If you have any kind of breeze at all, make sure that it's facing into the wind or it will spin around and flip over. Landings are as easy as they get: chopping the throttle will have the plane dropping slow and steady. It is still a biplane, so expect it to scrub a little more speed than you would with a single high-wing plane.

SPECIFICATIONS

NAME: Micro Tiger Moth
MANUFACTURER: Hobby People (hobbypeople.net)
TYPE: Front-yard flier
LENGTH: 10.4 in.
WINGSPAN: 12.7 in.
WING AREA: 57.5 sq. in.
WEIGHT: 0.53 oz.
WING LOADING: 1.33 oz./sq. ft.
POWER: Included
RADIO: Included
PRICE: $59.99

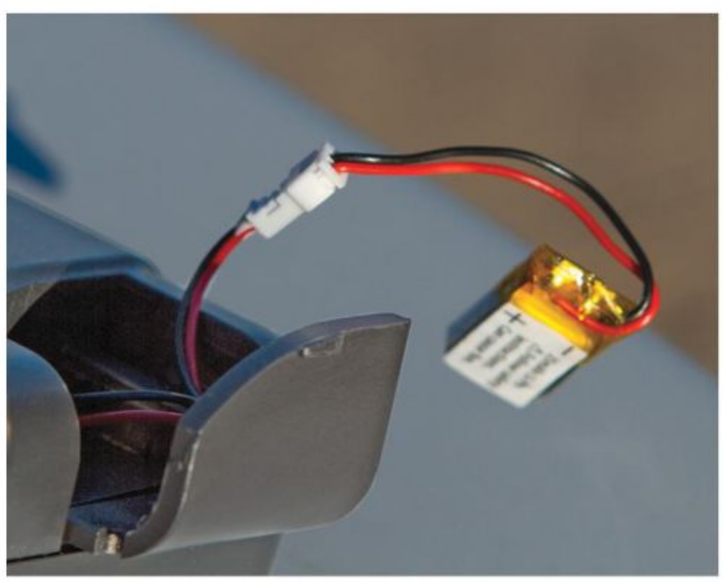
GEAR USED

RADIO: HP 3-channel 2.4GHz (included)
MOTOR: Brushed micro (included)
BATTERY: 1S 35mAh LiPo (included)
PROP: 4x4

HIGHLIGHTS

- Absolutely ready to fly; no assembly required
- Small size and easy to fly
- Great price-to-fun ratio
- You can take it with you anywhere

Above: The included transmitter is small but not too small. It is easy to hold but doesn't cramp your style.
Below: The plug for the built-in LiPo charger is in this compartment in the transmitter, which can also store the battery.



THIS TIGER MOTH FLIES NICE AND SMOOTH AND DOES WHAT YOU WANT, WHEN YOU WANT IT.

GENERAL FLIGHT PERFORMANCE

Stability: This plane is very small and very light, so stability becomes an issue if there are any gusts. It gets tossed around quite a bit with a light wind but is easy to recover from. Dead calm is the best condition, and a steady light whisper is acceptable.

Tracking: For the size of this plane, it tracks very well with no wind. A steady throttle has the Tiger Moth tracking straight with no trim adjustment. It turns smooth and holds its line just fine on calm days.

Aerobatics: This Micro Tiger Moth doesn't have a very large bag of tricks, but it will throw in a loop here and there under the right conditions.

Glide and stall performance: This plane glides really well; throttle off puts it in a nice smooth descent. Stalls aren't bad at all; the front just floats down nice and level, and recovery is effortless.

PILOT DEBRIEFING

In case you haven't noticed by now, this is a small plane. It is a front-yard/indoor flier that doesn't care for wind, but it can handle a slight breeze if need be. Overall, I was impressed with how well this little foamie flew. The magnetic actuators were on point, and the power matched the size of the plane. This Tiger Moth flies nice and smooth and does what you want, when you want it. It is a great little beginner biplane and an all-around fun plane to fly.

BOTTOM LINE

Once again, Hobby People has put together a fun little front-yard/indoor flier. There are some improvements over the older model Super Cub, which I reviewed in the past, and I don't have any complaints about this model. It's a blast to play with, and I am thoroughly impressed with how well this little guy works. Its low price is a bargain for plenty of flying fun in the sun and in the house.

Micro Controls for Micro Planes

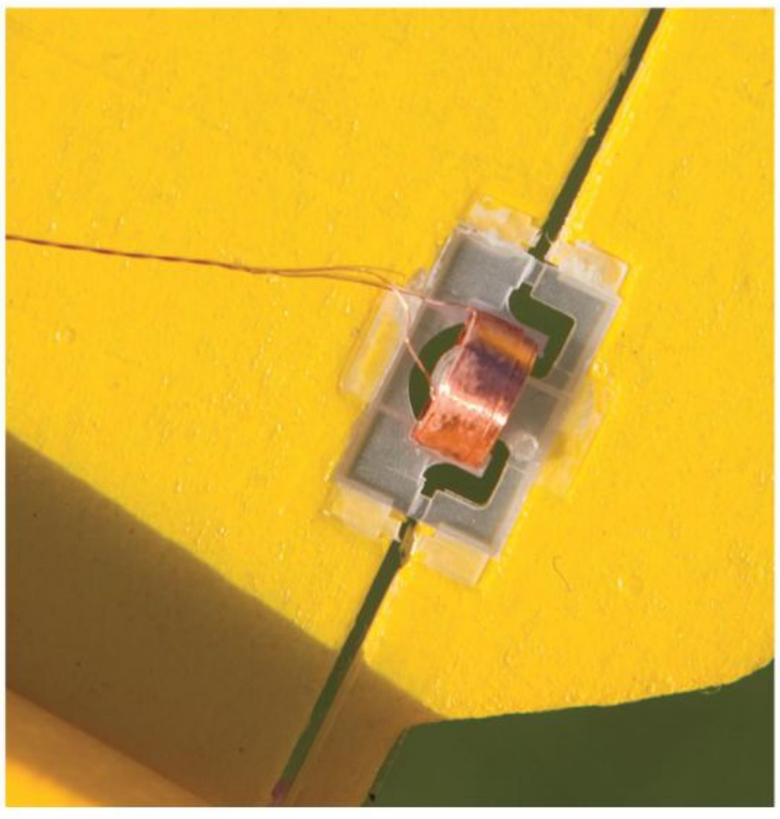
As planes get smaller, the need for lighter controls are a necessity. First, there are fewer places and less room to install a servo, and second, there is a lot less forgiveness for added weight. Shaving just the smallest amount of weight could be the difference between a plane that "kind of" flies and a planes that flies well.

It's amazing how small servos have gotten over the years; these micro fliers have combined receivers with speed controls and servos all together. When the size of the plane gets too small, however, magnetic actuators (like the two on this Tiger Moth) are the option of choice.

These actuators are lighter, take up a lot less space, and provide plenty of control for the size and weight of this plane. The ones on the Tiger Moth are also proportional, which give the pilot more control over what the plane is doing and a much better flying experience compared to a standard on/off actuator.

Another benefit, aside from the weight savings, is that the control surfaces aren't locked in by a servo. I know that sounds bad, but with something so light, you don't need as much hold on the control surfaces. And when using such thin material, it will move instead of folding or breaking if you bump the control surface (within reason, of course).

These tiny magnetic actuators provide just the right amount of control for this micro aircraft.



SNOWBIRD SNOW SKIS

"PARK FLYER" SNOW SKIS ALSO AVAILABLE
Great for Small Electric/Foamies See website for details

NOW 6 COLORS

NO MORE SEASONAL FLYING! DU-BRO SNOWBIRD SKIS MAKE IT POSSIBLE TO FLY ALL YEAR.
Easily mounts on airplanes with dural or wire landing gear in about 5 minutes. Snowbird Skis are made from high density polyethelene. Runners are molded right on the ski for better tracking.

Featuring a spring loaded design, our Snowbird Skis flex on take-offs and landings, yet remain in a positive lock position while in the air. All mounting hardware included.

DU-BRO Products, Inc. | ph. (800) 848-9411 | www.dubro.com **facebook.com/dubrorc**

E/Z BENDER WIRE FORMING TOOL

Will bend wire from 0º - 90º and makes perfect Z-Bends, L-Bends, landing gear & more! Features hardened steel forming dies for long lasting operation. Use with spring or music wire.
Cat. #480 - Wire: .015" - .047" **Cat. #481** - Wire: .062" - .093"

Tru-Spin Prop Balancer

Made in the USA
Catalog #499

Precise
Accurate
Versatile

Sensitive enough for Small Electric Props

Available:
Replacement Shaft for Prop Balancer
Cat. #959

DU-BRO

1-800-848-9411
www.dubro.com
Available @ Hobby Shops Worldwide

LET'S TALK GIANT SCALE

BY **JOHN GLEZELLIS**

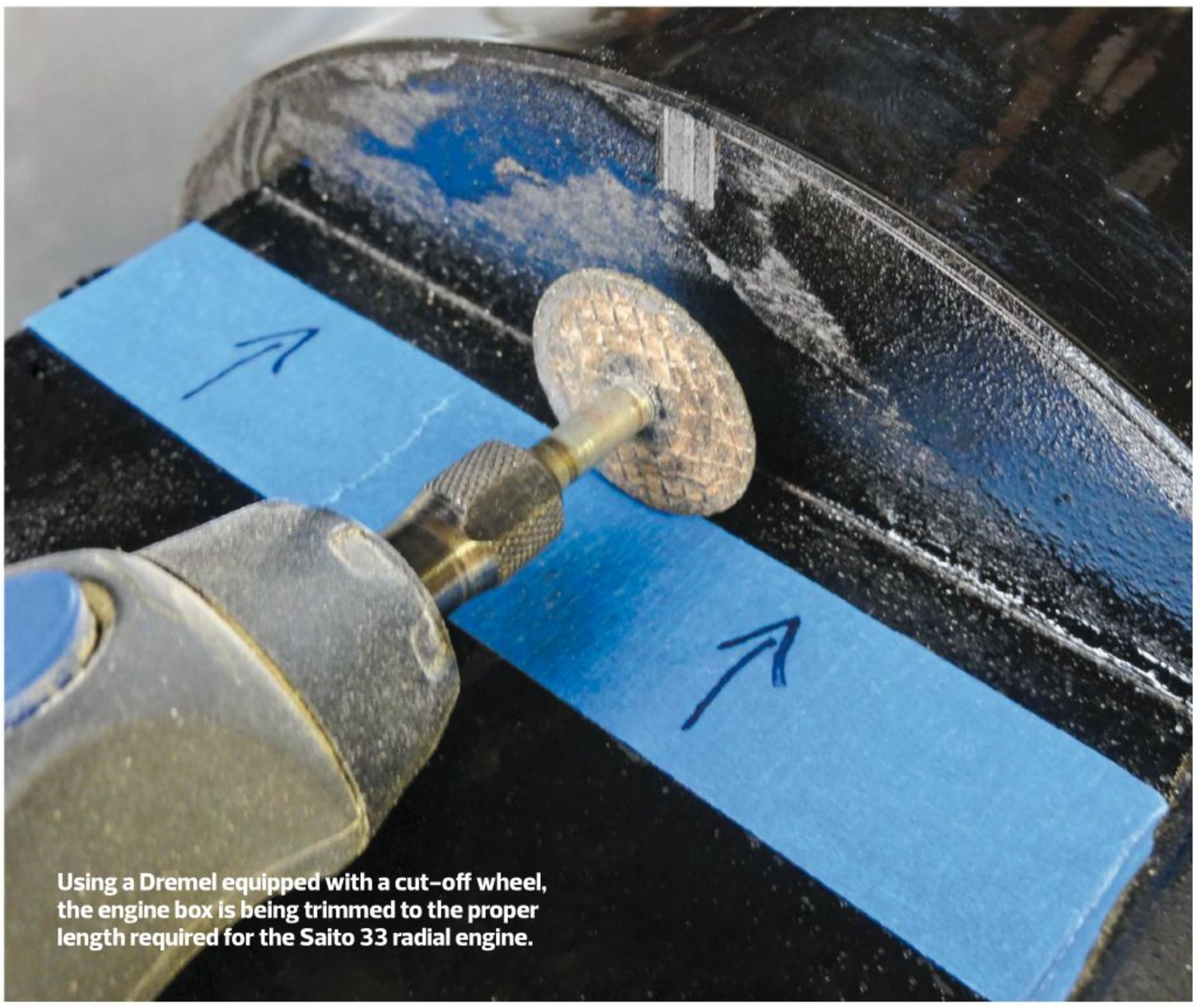
The author is getting ready to taxi the DHC-2 Beaver out to the runway for another flight.

Radial Engine Upgrade

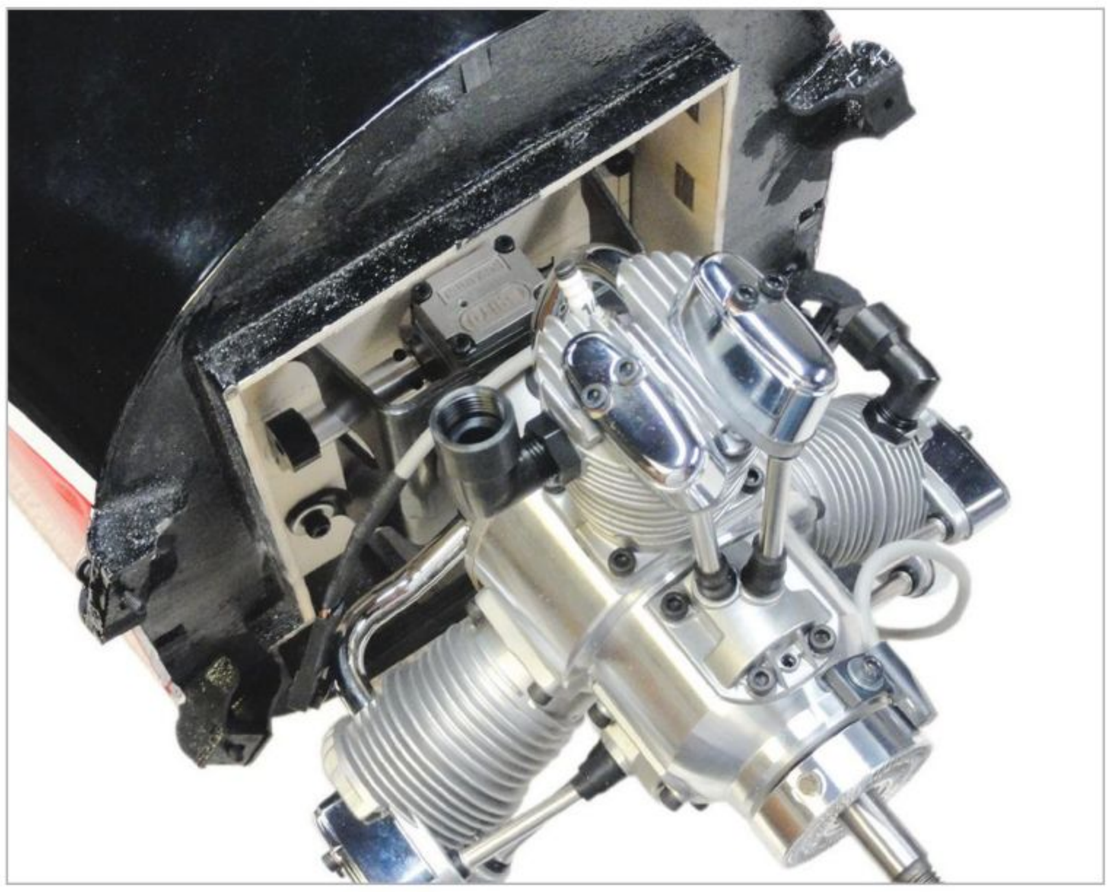
I recently built a DHC-2 Beaver from Hangar 9 (hangar-9.com). This airplane is designed around the Evolution 33cc two-stroke gasoline engine, but I wanted to add the realism of a Saito three-cylinder radial engine (saito-engines.info). This four-stroke engine not only offers a beautiful engine sound but also adds the benefit of clean and more economical fuel consumption. Installing the Saito radial engine requires a new setup for the fuel-tank system, throttle linkage, and servo installation as well as a few other options regarding the exhaust system. Let's get down to business!

AIRFRAME MODIFICATION

Most giant-scale airplanes feature an engine box built into the fuselage and secured at multiple points for strength. The



Using a Dremel equipped with a cut-off wheel, the engine box is being trimmed to the proper length required for the Saito 33 radial engine.



The Saito 33 radial engine has been temporarily secured to the firewall. I used Zap finishing resin to coat all exposed wood areas before the final installation of the engine.

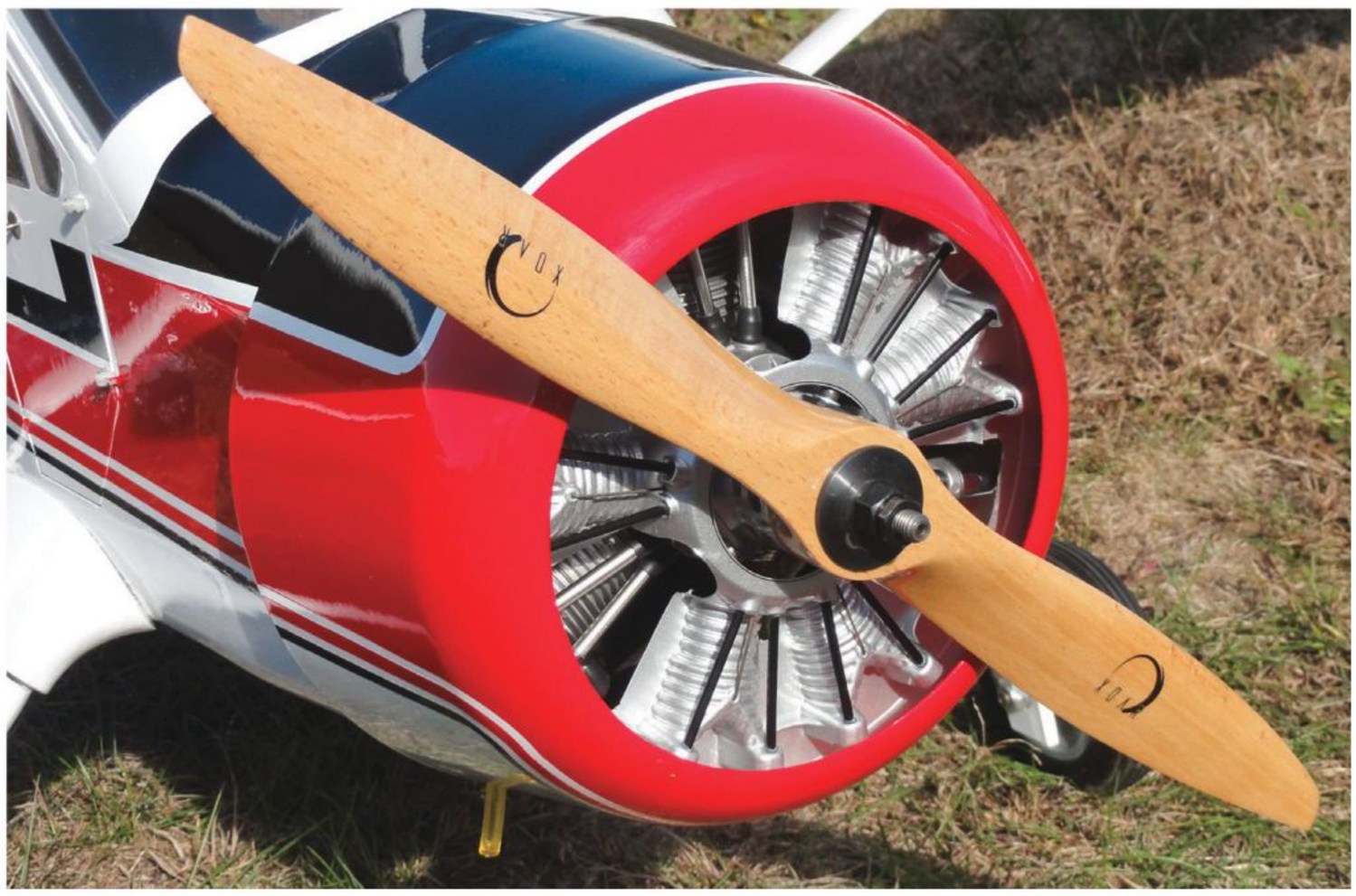
It is important to reinforce critical areas with spruce square or triangular stock. As shown in the photo, example components include the firewall and engine box.

Beaver is no different. Its engine mounting box features upper, lower, and side frames, and you then glue an already assembled engine box within these frames. This engine box contains the firewall and the bulkheads to secure the included fuel tank. The length of the radial engine (with the included mount) is longer than that of the Evolution engine, so the position of the engine box has to be adjusted. I measured the Saito 33R3's length from 1/4 inch behind the propeller to the engine mount. I then installed the cowl using that same distance. I marked this dimension with a pencil on the inside of the cowl. This showed the new location for the firewall. I then cut away the excess material from the front of the engine-box structure so that the engine (attached to the firewall) could slip into position. A Dremel Moto-Tool and a cut-off wheel did the job. A sanding block smooths the edges nicely.

I made a firewall template (including the engine mount bolt hole pattern) and worked out the positions for the throttle arm, carburetor venturi, and the fuel and vent lines. I then fabricated the new firewall, laminated together using three layers of 1/8-inch plywood using 30-minute Zap epoxy. For accuracy, I used a drill press for all required holes and openings. I bolted the engine to the firewall with four bolts and 8-32 blind nuts secured behind the firewall with medium Zap. At this point, I tack-glued the firewall into position and secured the cowl to ensure proper alignment. Once the engine was centered and the necessary propeller clearance existed, I traced the firewall's location onto the inside of the engine box. After removing the engine, I glued the firewall in place using 30-minute Zap epoxy. I then glued 1/4-inch spruce stock around the perimeter of the firewall (both the inside and outside) for added strength.

Because the new firewall is set farther inside the box, I made a new fuel-tank tray to include the throttle servo using 1/8-inch light ply and 1/4-inch square spruce. To keep the installation simple, the tray is the same width as the inner engine box. A bulkhead attaches the bottom of the tray to the floor within the aircraft. I then reinforced everything with the spruce stock cut to length, and I glued it into place.

I traced the perimeter of the tank onto a piece of paper and then made two 1/8-inch light-ply half-moon tank supports to secure the fuel tank to the tray. I glued the tank to the edges of the supports with silicone adhesive to isolate the tank and absorb some of the engine vibration.



TIP OF THE MONTH

Keep Cool with Engine Baffles

Keeping your engine from overheating is mandatory for consistent performance. Building baffles within the cowl to ensure that cool air travels through the surfaces of the engine is recommended not only on radial engines but also on all engines. My DHC-2 Beaver included a painted and finished dummy radial engine that fits into the front of the cowl. To provide proper airflow, I marked the three locations of the engine cylinders and made the openings slightly larger than the cylinders. After the dummy engine is installed, be sure to open the bottom of the cowl to provide twice as much air-exit area as the total of the three air-inlet openings.

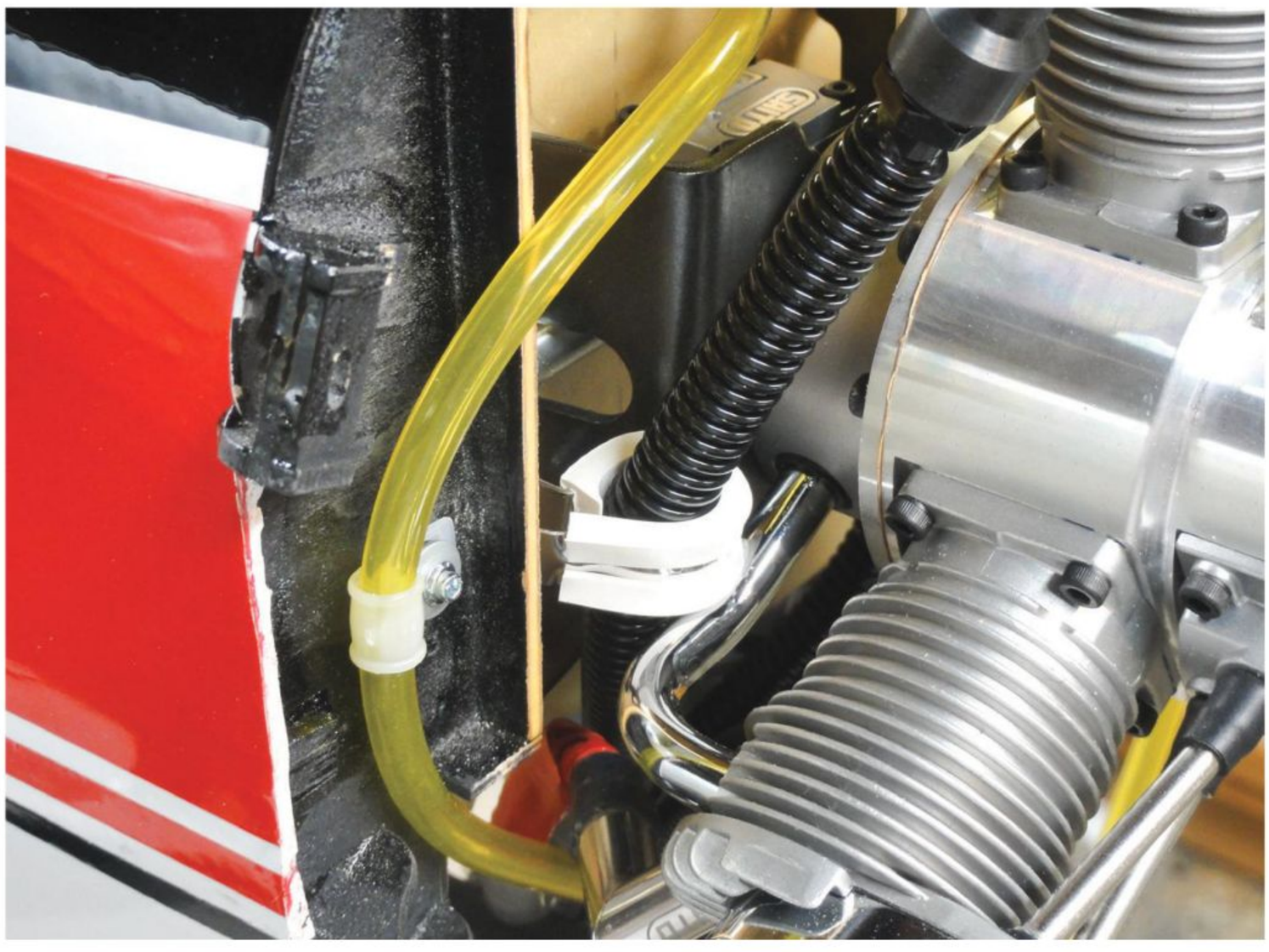
The initial exit for each of the three exhaust pipes has been cut using a Dremel, a cut-off wheel, and a sanding bit. Once the proper location is confirmed, the opening will be enlarged to a perfect circle to allow for proper clearance between the airframe and the exhaust.

The fuel tank has been installed and is held in place with a single Velcro strap.

Once the supports were secured in place, I cut two slots in the floor so that I could use a 1-inch-wide Velcro strap to secure the tank in place. I also retrofitted the included tank with tank-filter clunks from B&B Specialties (bbspecialties.com). These filters prevent foreign particles from entering the engine. Because the Saito engine has an electronic ignition module, I simply wrapped it in some Du-Bro (dubro.com) foam rubber and used Velcro to secure it under the tank floor. The ignition module has three spark-plug leads that fit through an opening that I made in the mount box.

THROTTLE LINKAGE

I used a 12-inch-long, 4-40 pushrod for the throttle linkage and placed the throttle servo on the tank tray. Making sure that the pushrod was perpendicular to the firewall, I marked the location of the servo and used 1/8-inch light ply to fabricate the servo mount. Once the mount was glued in place, the throttle servo and linkage was properly installed. I typically use ball links when the throttle-linkage geometry is offset. But because I installed the throttle servo in the correct location for a straight linkage installation, I used a standard threaded 4-40 clevis. I cut the pushrod to length and used a Du-Bro 4-40 solder link at the servo arm. For a smooth throttle response, it is important to use your radio's endpoint adjustment to fine-tune the throttle-servo travel settings. Start at the servo center position, and adjust each of the high and low throw settings so that they are about the same. If the high and low travel values differ by a large amount, the throttle response will not be linear.



Vibration-damping clamps were used to hold the exhaust pipe away from the engine mount and the throttle pushrod.

MUFFLER INSTALLATION

The Saito 33 radial features three separate exhaust pipes, and the pipes are bent to shape so that they fit through an opening on the bottom of the fuselage. The ends of the pipes are tied together using a bracket that clamps around all of the pipes and is secured to the firewall.

As another exhaust option, Keleo Creations (keleo-creations.com) manufactures an exhaust collector ring for the Saito engine. Just as with full-size engines, the ring directs the exhaust out of the bottom of the airplane. The collector ring has three individual headers that secure to each cylinder. This exhaust system is rigid and greatly simplifies the exhaust installation when the area within the cowl is limited.

FINAL THOUGHTS

Using an engine that's different than the one your airplane was designed for will require some modifications to the airframe. Using proper, well-thought-out construction and setup techniques will result in an aircraft that will operate properly and last for years.

TALON HV SERIES

With a voltage input range from 3S to 12S LiPo, and a 120A* continuous amperage capability, the Talon HV 120 is capable of handling up to 6000W of continuous power for a wide variety of heli and fixed wing applications. It's sleek aluminum case not only ensures your Talon HV stays cool during high power demand situations, but also looks the part while doing it.

This value-packed ESC is the first high voltage member of the Talon family and features the largest BEC (Battery Eliminator Circuit) we could muster. At the heart of this powerhouse is a 20A peak* BEC with selectable 6v or 8v output voltage.

For more information visit
castlecreations.com/talonHV

PERFORMANCE • STYLE • VALUE

castlecreations.com

Look for us on:

*RC HOBBY APPLICATION RATING: 120 amps for the duration of a single 10,000 mAh battery pack with the ESC in contact with a 5 mph airflow of 25C (77F) or cooler air. Controller temperature must never exceed 100C (212F). Exceeding current or temperature ratings may damage components and may shorten the life of the ESC. Always verify system current draw at full-throttle. Decrease load or increase airflow to decrease the ESC's operating temperature.

**Peak indicates a current level sustainable for the duration of a typical servo's transient current loads. Your setup may vary. Always confirm servo current draw before the first flight of the model.

Flight Test

FMS/DIAMOND HOBBY MXS 3D

SCRATCH THAT AEROBATIC ITCH FAST WITH THIS GREAT-LOOKING FOAM FLIER

BY **MIKE GANTT** PHOTOS BY **JOHN REID**

MORE AND MORE NEW PILOTS are entering the 3D model-aircraft scene, and it seems that time is always of the essence. Busy schedules like to dictate that the must-have model airplane is the one that goes from out of the box and into the air hassle-free and in minutes rather than in hours or days. FMS has this foam-model market on target and has introduced a new specimen for aerobatic junkies, like me. A perfect rear-car-seat size, the MXS has a wingspan measuring 1100mm (43.3 inches), and if that isn't ideal for you, the wings and stabilizers can be removed. The MXS is not only easy to take anywhere but also easy to assemble. An incredibly low parts count and an extremely simplified final assembly get you on the runway superfast. The included well-formed foam insert is double-boxed and contains a fuselage, wing halves, elevator halves, carbon-fiber reinforcements, landing gear, side-force generators, and a small hardware bag. The manual has easy-to-follow directions and flying tips. Almost everything you need to fly is included, even a few extra fasteners should you lose one. You will need, however, your transmitter and a small 4- to 6-channel receiver as well as a 3-cell 2200mAh LiPo battery pack.

SPECIFICATIONS

NAME: MXS
MANUFACTURER: FMS
DISTRIBUTOR: Diamond Hobby (diamondhobby.com)
TYPE: 3D foam monoplane
LENGTH: 42.5 in.
WINGSPAN: 43.3 in.
WING AREA: 478.7 sq. in.
WEIGHT: 39.45 oz.
WING LOADING: 11.87 oz./sq. ft.
RADIO REQ'D: 4+ channel
PRICE: $180

GEAR USED

RADIO: Spektrum DX-18G2 w/ AR6100E receiver (spektrumrc.com), four FMS digital metal-gear servos (installed)
MOTOR: FMS 1250Kv brushless outrunner and 40A speed control (installed)
BATTERY: Hobby People 3S 2200mAh 30C (hobbypeople.net)
PROP: 11x5.5

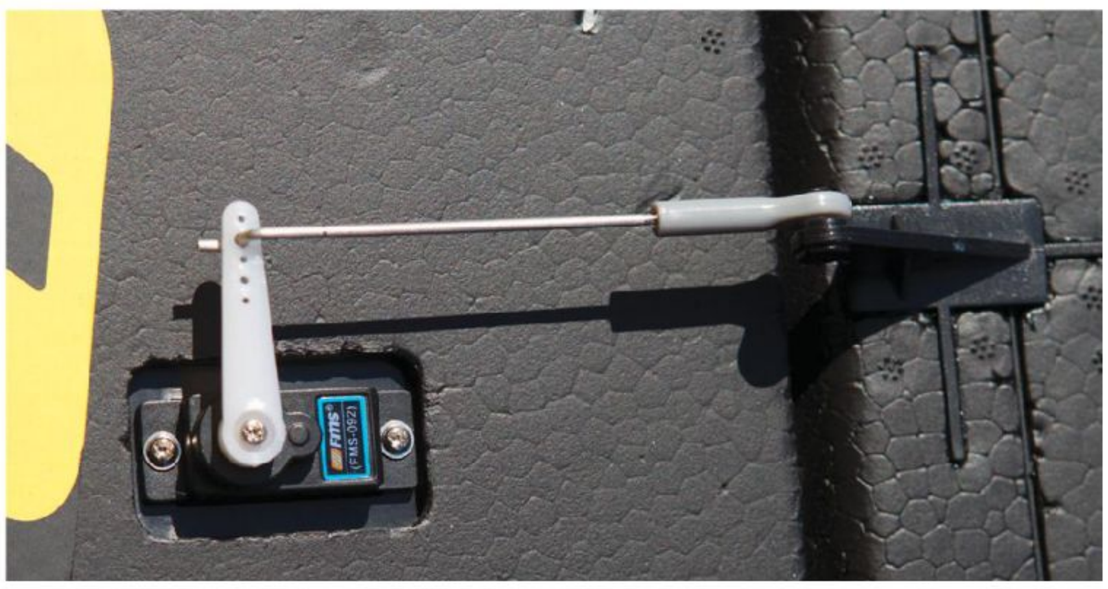
HIGHLIGHTS

- Superfast assembly
- Cool color scheme
- Easy to transport
- Versatile flight performance

Left: A large magnetized hatch opens to reveal plenty of room for the required electronics.

Top right: The tailwheel and rudder linkage were installed at the factory.

Bottom right: Long 3D servo arms and smooth ball-link-style connectors ensure full deflection and smooth operation.



FROM THE TIME THE BOX WAS OPENED AND PARTS FREED FROM THE CARTON, I WAS ABLE TO ASSEMBLE THIS AIRPLANE IN ABOUT 15 MINUTES.

UNIQUE FEATURES

Prefabrication is extremely high here as the fuselage component is delivered with a 1250Kv brushless outrunner, 40-amp speed control, and tail servos already installed. The rudder, tailwheel, and their linkages are already attached so no hinging or control-rod completion is required. The stabilizer/elevator halves slide over a carbon-fiber joiner rod, and key together into a tight-fitting, precut slot with two small screws for a permanent connection. Adding the elevator control rod takes seconds and is the only linkage you need to install. All linkages are all smooth-moving ball-link style and can be adjusted via threaded ends. Up on the nose, a prop and spinner have been added at the factory, and the spinner is slick in that it has spiral cutouts that allow air to pass through for cooling. There are cooling holes in the cowl, as well, so it looks like the power system should have plenty of airflow. Two holes have been cut in the bottom rear of the fuse for airflow exit.

Keeping the prefab level up, FMS has completed the assembly of the landing gear for you, as well. Aluminum mains are finished off in black and have 2 1/2-inch foam wheels added; the entire assembly is attached to the airframe with three machine screws. If you have come this far, all that is left to do is install the main wing halves. Similar to the horizontal part of the empennage, the wing halves fit over a carbon-fiber joiner and into respective pockets in the fuselage. The tolerance is right on, so if you run into resistance when adding the wing, don't force them but rather squeeze the foam at the wing's root to compress it a little and try again. When seated properly, the four included wing fasteners will drop right in, tighten with ease, and keep the wing in place even during those high-G maneuvers. At this point, you're pretty much done, and it is time to add a receiver. I'm a proponent of using the smallest receiver available, and if you use a 4-channel unit, an included Y-harness will allow you to hook up your ailerons without a trip to the hobby shop. As for flight packs, you'll want to use your lighter-weight 3S 2200mAh or similar battery pack. Hook-and-loop tape has already been adhered to the floor of the fuselage interior, and two hook-and-loop straps have been installed, as well, to hold the flight battery.

IN THE AIR

The big, 2 1/2-inch wheels will allow you to fly from grass and some not-so-perfect landing strips. The tailwheel and rudder do a nice job, so driving the model around on the airstrip feels positive. When it's time to roll out, the plane easily jumps off of the tarmac in short order and can climb vertically if you want it to. For the first flight, I set the timer to five minutes, which ended up being a little conservative. Flight times will always vary due to many factors, the most significant being throttle management. When it's time to give your battery a rest and set the MXS back down, keep the power on and wings level and it will settle into a shallow and predictable path. A small flare before touchdown will lead to a smooth return to roll.

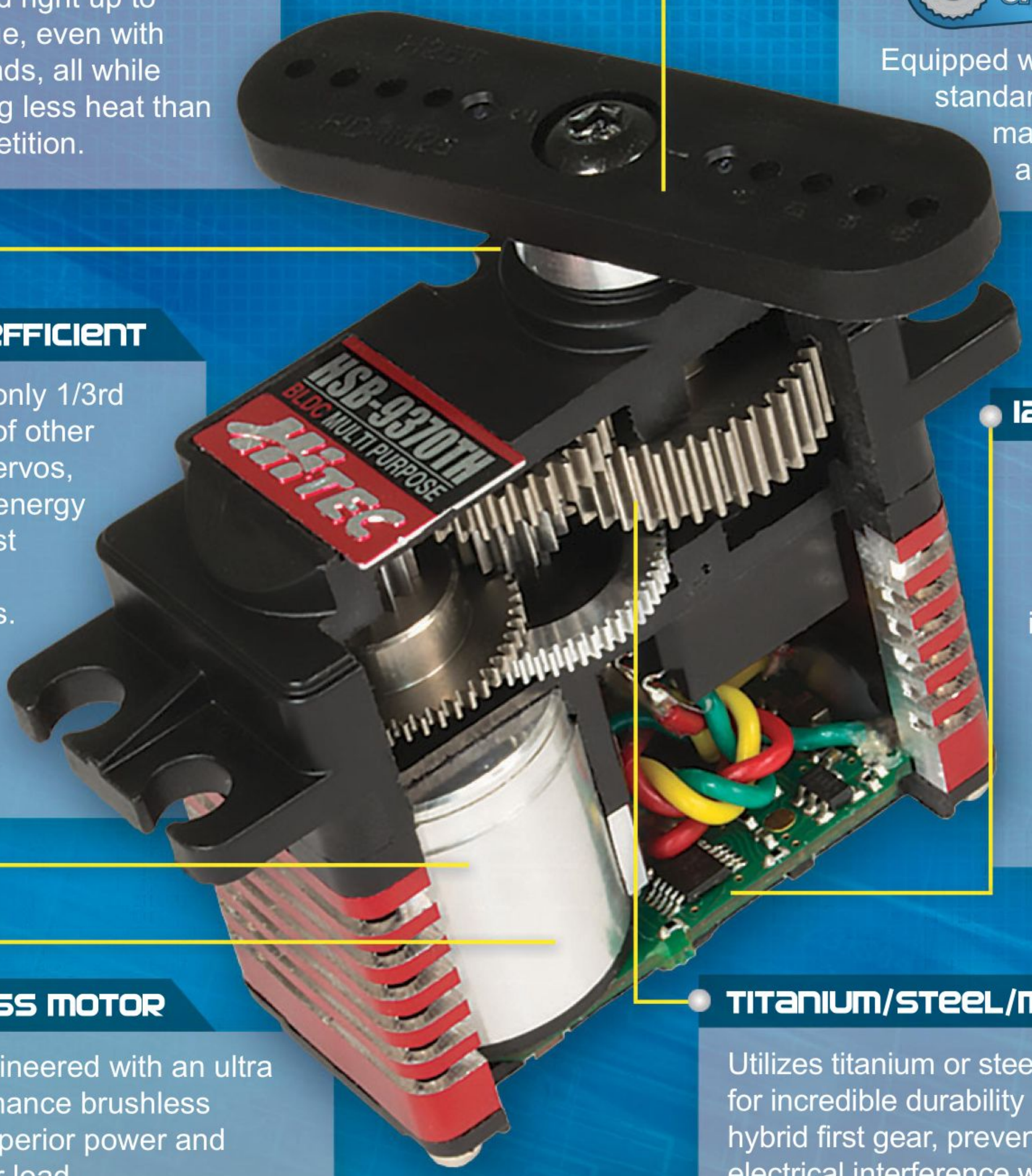
CONSTANT OUTPUT

Maintains constant torque and speed right up to stall torque, even with higher loads, all while generating less heat than the competition.

25-TOOTH SPLINE

25T STANDARD SPLINE

Equipped with the industry-standard spline size for maximum flexibility and compatibility.



ENERGY EFFICIENT

Consumes only 1/3rd the current of other brushless servos, conserving energy with the most efficient of technologies.

ENERGY EFFICIENT BRUSHLESS SERVOS

12-BIT CIRCUIT

Controlled by Hitec's 12-Bit Digital Circuitry for the ultimate in programmable response.

12 BIT PROGRAMMABLE

BRUSHLESS MOTOR

Custom engineered with an ultra high performance brushless motor for superior power and speed under load.

TITANIUM/STEEL/MPD GEARS

Utilizes titanium or steel gear trains for incredible durability and a MPD hybrid first gear, preventing inadvertent electrical interference within the model.

HiTEC

IT'S WHAT'S INSIDE THAT COUNTS

We have designed and engineered our brushless servos using the most advanced technologies and materials on the market today. They are built to improve your project's performance, efficiently conserve energy and are protected against all elements. Choose from three titanium masters or three steel aces with torque ranging from 187 to 472 oz-in and with speeds as lightning fast as 0.06 sec/60°. When it comes to quality and first-rate manufacturing, Hitec is paramount to all the rest. All servos are NOT created equal. Invest in your hobby with Hitec!

HiTEC RCD USA, INC. | 12115 PAINE STREET | POWAY, CA 92064 | (858) 748-6948 | WWW.HITECRCD.COM |

GENERAL FLIGHT PERFORMANCE

Stability: Aerobatic planes are not really made to be stable, and that is what affords them the flight envelope we enjoy so much. On the other hand, you could lower the rates and tame the MXS a bit and it will almost fly like a sport trainer. Initial testing was conducted with a center of gravity at approximately 3 1/2 inches back from the leading edge at the fuselage.

Tracking: After trimming, all transmitter controls were zeroed, and the control surfaces mechanically readjusted as necessary. This method ensures the least use of subtrim/trim, which can degrade servo resolution. After trimming, the MXS tracked quite well.

Aerobatics: Rollers are fast, snaps are fast, and pop-tops, walls, and waterfalls can be used to show off the MXS's structural integrity. The airframe has great strength and takes the tortures of rigorous freestyling effortlessly.

Glide and stall performance: If you power the prop properly and pull back on the elevator, flying beyond the stall feels fine. As with all models this size and weight, it will drop a wing if you let it. Practicing your aerobatic antics up high is always a good idea before hucking down on the deck.

MX Aircraft MXS

The MXS project began in 2001, with the first flight of the original prototype taking place in 2003. A great deal of flight testing was done with that first plane, and as a result, many refinements were incorporated into the production prototype, which is the plane flying in Abu Dhabi on March 17, 2006. The first production run numbered only six aircraft.

MX Aircraft has quickly become a name synonymous with the specialty production of next-generation sport, aerobatic, and race aircraft. The MXS models are built for speed, responsive handling, and rapid maneuverability, and that is exactly what they deliver—and why five of the world's most famous pilots chose to fly MXS planes in the Red Bull Air Race World Championship. Built with state-of-the-art design and technology, the plane has an advanced aerodynamic efficiency. And it is made entirely out of aerospace-grade Toray carbon fiber, which gives it outstanding strength and durability and allows the aircraft to withstand the forces needed to compete in the Red Bull races and other aerobatic flying sports.

THE AIRFRAME HAS GREAT STRENGTH AND TAKES THE TORTURES OF RIGOROUS FREESTYLING EFFORTLESSLY.

PILOT DEBRIEFING

A fully outfitted airframe, the MXS needs only your receiver and a low cost 3S flight battery to perform. A catchy color scheme is easily oriented in flight, and a wide and forgiving flight envelope combine to give any pilot a shot at flying 3D.

BOTTOM LINE

From the time the box was opened and parts freed from the carton, I was able to assemble this airplane in about 15 minutes. I hope that you have a balance charger and can quickly charge your flight pack because you will want to fly the MXS as soon as you see it on your doorstep! In addition to your 3S LiPo battery, you need only your guidance system and then your MXS will be good to go.

Hobby People®

Everyday Big DEALS

hobbypeople.net
In Store and ONLINE

FLASH!

Hobby People Is **Now Open In Santa Clara, California!** Find More Info On Our Web Site: hobbypeople.net

Ele RC KIT R/C
Only from Hobby People!

NEW!

SAVE $5.00

Sunday Flyer

Aerobatic Profile Airplane Kit

- CAD Designed, CNC Laser Cut Parts
- Easy Tab-and-Slot Parts Assembly
- Classic 3D Looks

№ 128321
Reg. $29.99 **SALE! 24.99**

MICRO R/C

Wingspan: 12.7in

NEW!

SAVE $10.00

Micro Tiger Moth

Front Yard Flyer RTF 2.4Ghz

№ 117209
Reg. $79.99 **SALE! 69.99**

MICRO R/C

SAVE $10.00

Wingspan: 13.7in

Micro Super Cub

Front Yard Flyer RTF 2.4Ghz

№ 117211
Reg. $69.99 **SALE! 59.99**

MOTORGLIDER

NEW!

Wingspan 82.7in
Brushless
2-Piece Wing

LOW PRICE

Quest EP RTF

2.1M Electric Sailplane, EPO Foam

№ 117217
List $391.10 **ONLY 219.99**

Brushless Motor DEALS

G-46

BL Aircraft Motor

(4250/06) 650kv 4mm Bullets

№ 129066, List $93.30 . . . . . *ONLY* **59.99**

G-91 BL Aircraft Motor (4260/04) 600kv 4mm Bullets

№ 129070 List $109.50 . . . . *Only* **67.99**

2814/06 Brushless Motor w/Hardware

№ 129026, List $49.10 . . . . *Only* **33.99**

2826/05 Brushless Motor w/Hardware

№ 129036, List $63.50 . . . . *Only* **43.99**

Great Servo DEALS

Lowest Prices!

SAVE $10.00

HP-D58MHV

Hi-Torq MG BB Digital Servo 208oz-in

№ 119158, Reg $29.99 . . *ON SALE* **19.99**

HP HP-A38N Standard Analog Servo, List $14.30, **№ 119035** . . . . . *Only* **8.99**

HP HP-A15N Micro Analog Servo, List $14.30, **№ 119015** . . . . . *Only* **8.99**

HP HP-PRO Micro-67 HV Digital Servo List $62.20, **№ 119221** . . . . *Only* **39.99**

Li-Po Battery DEALS

Lowest Prices!

SAVE $10.00

11.1V 3200mAh (3S) 30C LiPo Battery - T-Conn

№ 118390, Reg. $37.99 . . . . *SALE* **27.99**

HP 11.1V 2200mAh (3S) 30C Li-Po Battery, **№ 118387** . . . . . *Only* **15.99**

HP 11.1V 800mAh 3S 30C Li-Po Battery, BEC Plug, **№ 118375** **14.99**

HP 14.8V 3200mAh (4S) 30C Li-Po Battery, T-Conn, **№ 118391** **44.99**

Charger & Meter DEALS

SAVE $10.00

Full 80 Watts!

Activator 80 AC/DC Charger, 7A Multi-Chemistry Cycler

№ 118552, Reg. $79.99 . . . *SALE!* **69.99**

HP Activator Ultra 100/120W AC/DC Touch Screen, **№ 118561** . *SALE!* **119.99**

HP Battery Alarm (2-8S) w/Volt-Check (1-8S) Li-XX, **№ 118531** **9.99**

HOBBY PEOPLE Has The Quality Aircraft & Accessories You Need — *For Less!*

Top Wingspan: 39in

All Foam, RX-Ready

WACO

Biplane EP Rx-R BL (No Tx/Rx/Bat/Chgr)

SAVE $50.00

№ 117239
Reg. $149.99 **SALE! 99.99**

Wingspan: 63in

Length: 45.2in

All Wood, ARF

VQ ARFs

Dauntless SBD *DETAILED!*

46 Size EP/GP Scale Warbird

№ 160017
List $381.30 **ONLY 219.99**

Safety First

SAVE $10.00

Battery Condition Meter

with Balancer & Cell-Check

№ 118541
Reg. $24.99 **SALE! 14.99**

AIRTRONICS 2.4GHz

WOW!

RDS8000

8 Channel, 2.4G Radio, Mode 2 w/92824 RX

№ 751700
List $299.99 **ONLY 199.99**

Hobby People® 19 Stores In So. California and Nevada. Find one near you online.

Some sale items limited to stock on hand. Prices and specifications subject to change without notice. Not responsible for inadvertent errors in this ad. **MAN-02-2016 issue.**
Prices effective Dec. 1 to Dec. 31, 2015.

HOW TO

MAKE AND INSTALL A SCALE ROTARY ENGINE

A REALISTIC ENGINE COVER-UP FOR YOUR WORLD WAR I AIRPLANE

TEXT AND PHOTOS BY **GERRY YARRISH**

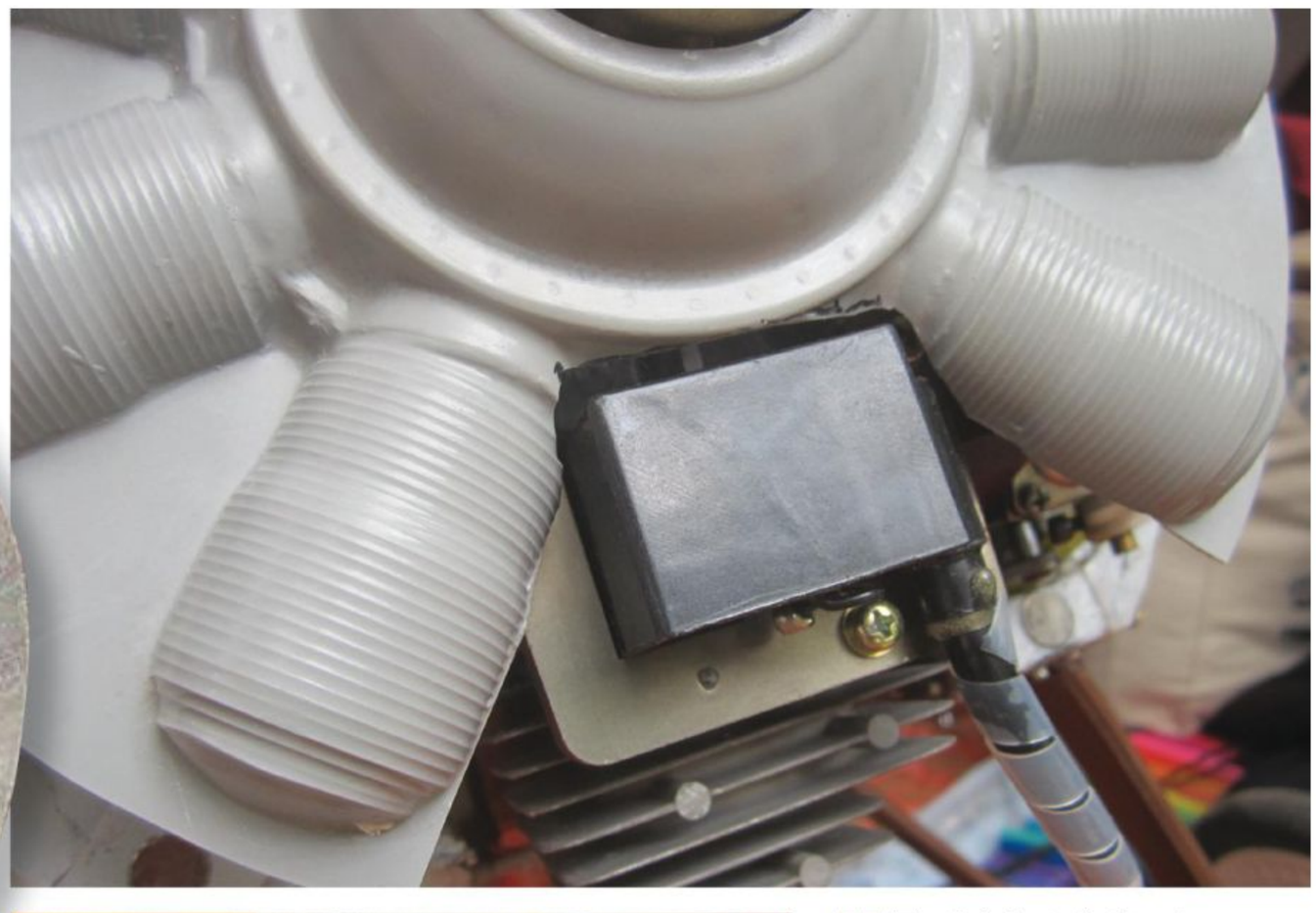
In our online build-along series for my Sopwith Camel (featured in the December 2015 issue), I featured many mini projects as they popped up during the Camel's build. I test-flew the Sopwith Camel back in June and flew it several times over the summer, all with my Zenoah G-38 engine fully exposed in that big open engine cowl. To help dress up the Camel, I recently installed a scale rotary engine, and the techniques involved can easily be used for any similar round-nosed airplane that you might want to build. Here's how it's done.

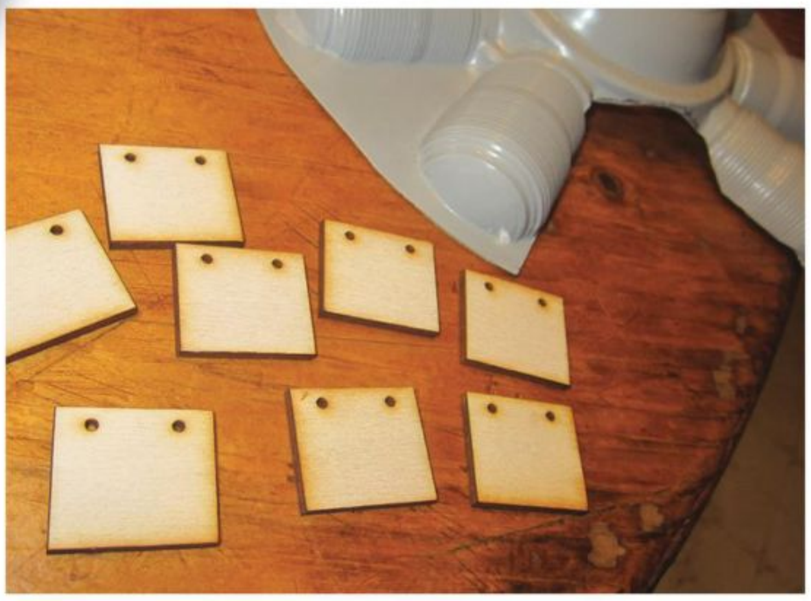
STARTING POINT

1 Balsa USA is a great source for all things World War I, and it offers fiberglass dummy engines. The nine-cylinder molding is made with several layers of fiberglass cloth and has a nice smooth gel-coat finish. The first thing to do with any molded fiberglass part is to use a Dremel Moto-Tool and a grinding bit to remove any sharp edges or areas starved of resin. After this, throw it in the kitchen sink and scrub it with dishwashing detergent to remove any leftover mold release agent.

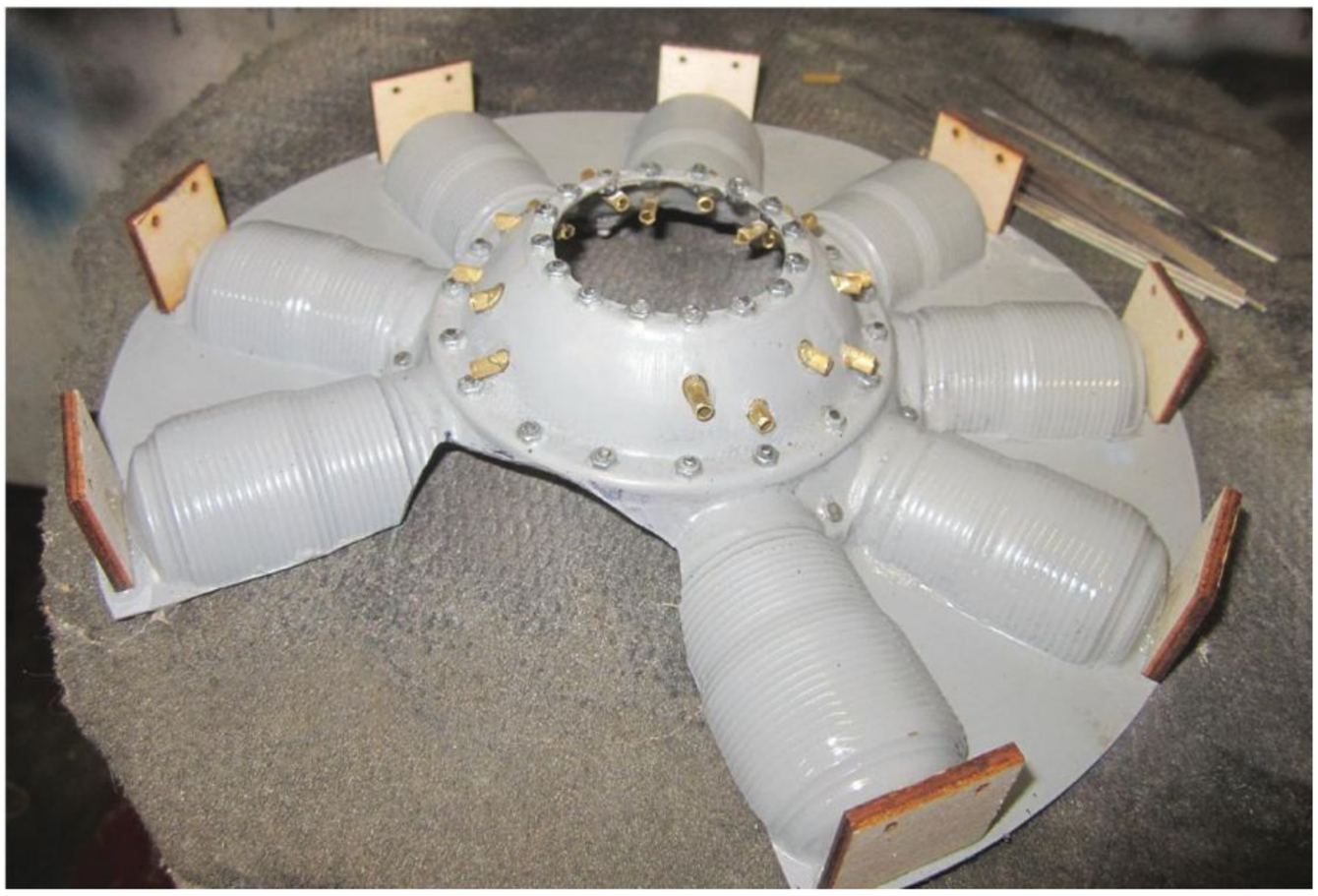
2 The next step is to open up the center of the crankcase so that it will fit over the prop hub of your model's engine. My Zenoah G-38 has a flywheel and a magneto ignition unit in front, so I also removed one of the molded cylinders. More important, this opening also allows cooling airflow to enter the engine compartment.

3 Making these openings is easy with a Dremel Moto-Tool and a Robart Tough Grind cut-off disc. Test-fit the molding over the engine, and make sure that there is about 1/8 inch of clearance all around so that the engine vibration won't chafe any parts. You can also see that the cylinder is right in the line of fire for airflow.





4 For this installation, I attached the scale engine to the inside front lip of the engine cowl. To do this, I made several light-ply guide/supports and glued them to the engine molding. Each has two 1/16-inch holes set at the proper spacing to hold the pushrod wires. Because one of the cylinders was removed, eight supports are required.

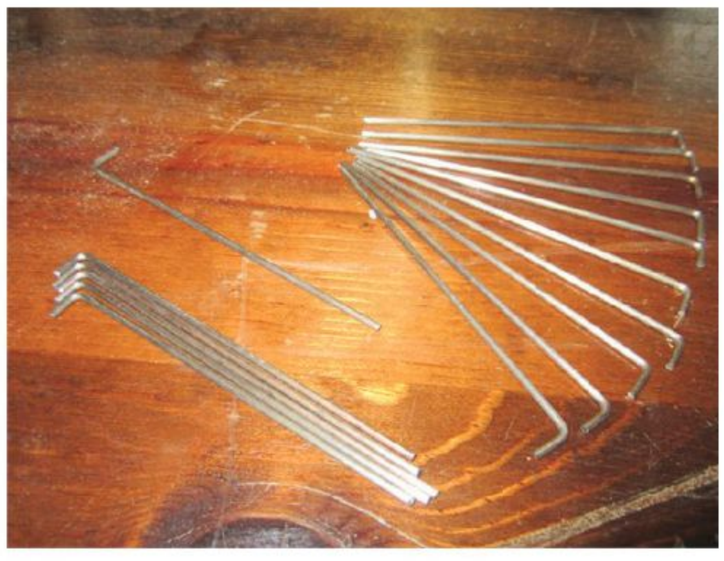


5 Here, you see the supports glued into place on the back web, just above each of the cylinders. At this point, I have added nuts and screws around the center opening, and drilled holes in the engine case and added the pushrod bushings (made out of short sections of K & S brass tubes) to support the pushrods, which will be added later. I used medium and thick Zap glue throughout. Be sure to go light with the Zip Kicker accelerator as it can cause the glue to foam up, which will not help the finish.

PAINTING

You don't a need fancy paint gun or an airbrush to paint the scale engine. To begin, I spray on a couple of light coats of metallic silver from Décor. This paint dries quickly and gives a realistic, almost chrome look to the part. I like using this bright undercoat and then build up the other weathering coats over it. The paint really makes all the bits and pieces come together for a realistic scale appearance.

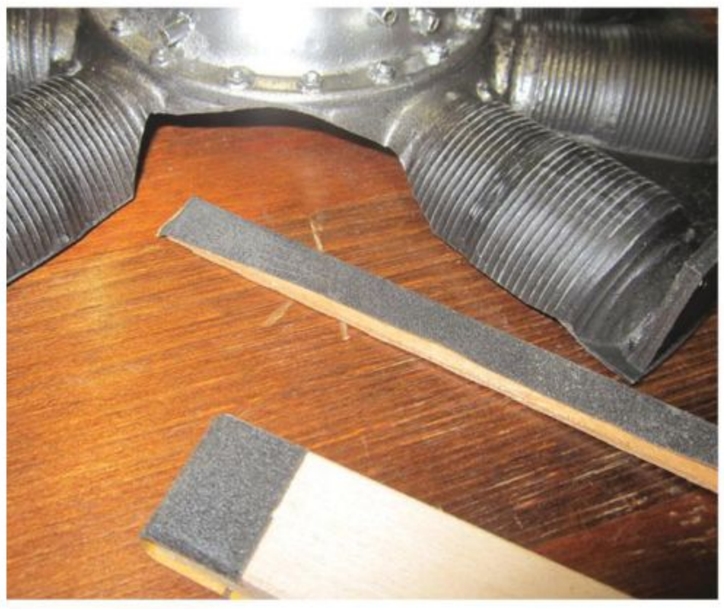
Next, the cylinders and the back webbing between them are spray-painted black. I have found that there is no need to carefully mask off the engine case while spraying the cylinders. I used Décor flat black spray paint, which dries quickly. There will be a slight amount of overspray along the edges of the crankcase, and that's what we want. Once the paint dries completely, additional detailing and weathering will help bring out the finer details and improve the overall realism.



The 16 pushrods are made from lengths of 1/16-inch welding rod that I have sanded smooth and clean. Welding rod has a natural metal finish, so no painting is required. Each end is bent 90 degrees about 1/4 inch.

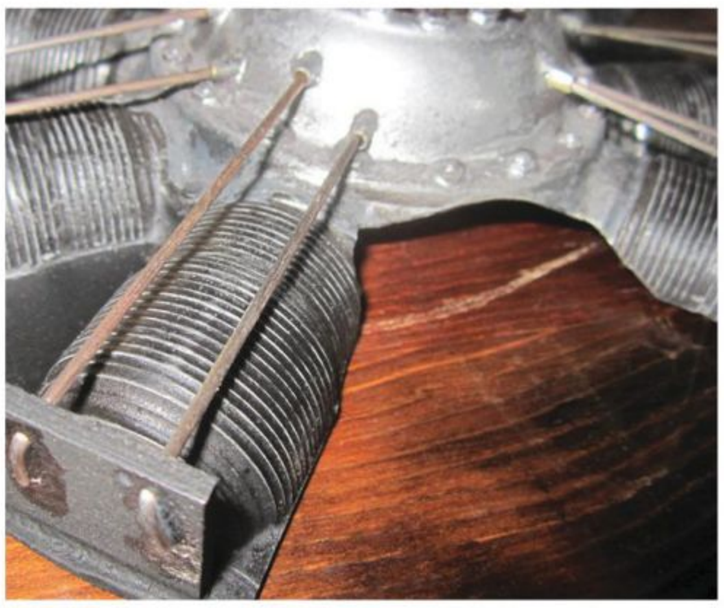
WEATHERING

9 For any sport model, this would be enough of a finish and would look great. You could just add the pushrods and call it a day. But for my Camel, I wanted a more "used" appearance. Before installing the pushrod wires, I glued some 320-grit sandpaper to some scrap wood to form sanding sticks. I made a wide one for the top of the cylinder and a narrower one for the cylinder bases. By carefully sanding away some of the black top coat, you start to expose the underlying silver color. This kills some of the sheen of the black paint and adds depth. Don't get heavy-handed here, as you will only make the silver lines (tops of the cooling fins) wider. If this does happen, don't worry. Just repaint with some more black, let it dry, and start again.

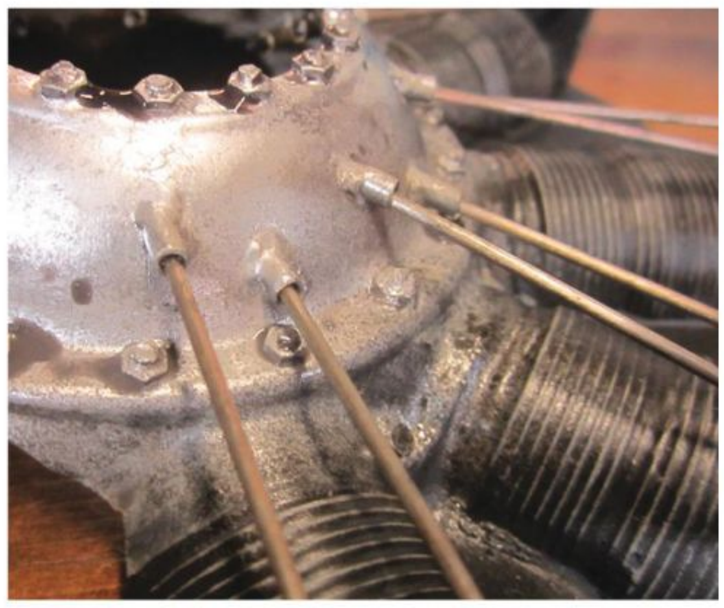


10 After sanding the fins, go around the engine case and apply a very thin dark gray wash of watered-down acrylic paint. When dry, the wash fills in the seams and edges, and really brings out the surface detail.

11 After the weathering wash has been applied, add the pushrod wires by slipping them through the wood guide plates and into the ends of the brass bushings in the crankcase. Just a little Zap holds them in place.



12 Here, all the pushrods have been installed. The guide plates will be hidden by the lip of the engine cowling and won't be easily seen. Glue all of the pushrods to the inside of the bushing tubes from the underside of the scale engine, as well.



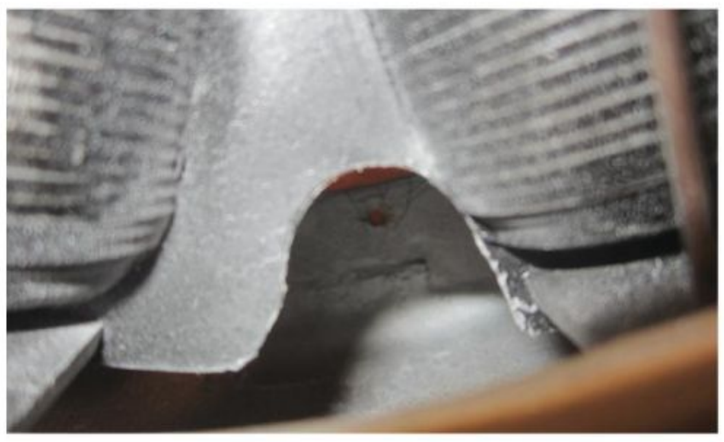
13 Here is a close-up of another application of black and light gray washes. These will pool around surface details and, when dry, show off the seams and joints of the details. The washes are applied using a thin fine-tipped brush. Apply the wash to any of the flat areas and in the nooks and crannies where the real engine would gather dust and oil residue. Let it all dry. You can speed the process with a heat gun, but I find that letting the washes evaporate naturally produces the best staining.

INSTALLATION

14 The guide plates support the pushrod wire ends and provide excellent attachment points for the scale engine to be glued to the inside of the engine cowling. Place the scale engine over your model's engine, and reattach the cowl. Make sure that the scale engine is centered on the prop hub and that nothing comes in contact with the G-38 when the propeller shaft is turned. Hold everything in place, and tack-glue a couple of the guide plates to the inside of the cowl using Thick Zap and Kicker. Remember, before applying any glue, it is very important to clean off the inner surface of the cowling to ensure a strong glue bond. I use MEK to remove all the paint and primer from the inner surface of the fiberglass cowling. After the glue sets, tack-glue a couple more plates to the inside of the cowling. Once you have three or four plates glued in place, you can remove the cowl. This photo shows the back of the scale engine tack-glued to the cowl.

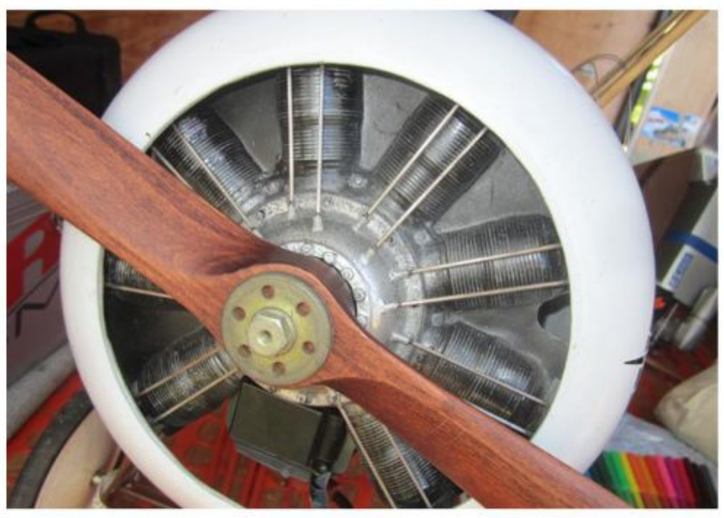
15 This shows a close-up of one of the plates glued to the cowl. Finish gluing the rest of the guide plates in place, being sure to build up a strong fillet around the guide plates. If there is a space or open seam at the glue joint, use a scrap piece of wood to fill it and then build up a strong fillet of Zap glue and hit it with a light application of Zip Kicker.

16 Here's the finished application. Notice that you can't really see the guide plates supporting the scale engine. In this setup, the area around the scale engine also allows cooling airflow into the engine cowl.



17 To get to any attachment screws for the engine cowl, be sure to make some openings in the webs between the cylinders. The openings do not need to be large—just big enough to get to the screws with a long screwdriver or hex-driver to secure your engine cowl in place.

18 Reinstall the engine cowl, and check the clearances around the model's engine. Try to have at least a 1/8-inch space all around. When everything lines up properly, remove the engine one more time and give it a few light coats of honey-colored clear urethane spray finish. This will seal the wood guide plates and coat the pushrods so that they don't corrode.



19 That's it! It certainly is a lot less work than scratch building your own scale WW I cover-up. After a few flights, be sure to check the clearances between the scale engine and the propeller hub. If anything starts to rub, use your Dremel Moto-Tool and grind away any interference points to increase the clearance.

BOTTOM LINE

The molded scale rotary engine from Balsa USA is an excellent starting point for any round-nosed airplane. After installing it, be sure to check on how your engine runs. If it starts to run a little hotter, richen the top end a smidge and recheck the idle transition. You should maintain a 2:1 ratio for air-out versus air-in airflow area. That's twice as much exit area compared to the air-intake area.

Flight Test

JR AMERICAS Ninja

ADD 3D AEROBATICS TO YOUR FLIGHT REPERTOIRE

BY **KLAUS RONGE** PHOTOS BY **PETER HALL**

RENOWNED FOR ITS WORLD-CLASS RC HELICOPTERS, JR Americas has entered the multirotor market with the Ninja 400MR. This sleek design is fully aerobatic and intended for pilots who enjoy flying multirotor aircraft without all of the electronic aids available on many of today's drones. I reviewed the ready-to-fly Ninja, which comes with a JR XG6 DMSS transmitter and an RG731BX XBus receiver. It is also available in kit form, and an optional camera mount is available if you want to capture your aerial stunts in video. [Editor's note: JR Americas now includes this camera mount in all ready-to-fly Ninjas.]

SPECIFICATIONS

NAME: Ninja 400MR
MANUFACTURER: JR Americas (jramericas.com)
TYPE: 3D aerobatic quadcopter
SIZE: 400mm
WEIGHT: 31 oz.
MOTORS: Four NJM-01 10P-1400Kv motors (installed)
RADIO: JR XG6 DMSS transmitter (included), RG731BX XBus receiver (installed)
BATTERY: Hobby People 2200mAh 3S LiPo (hobbypeople.net)
FLIGHT-CONTROL SYSTEM: NFC-01 six-axis gyro stabilization (installed)
SPEED CONTROLS: 18-amp (installed)
PROPS: 8 in. (included)
PRICE: $700 (RTF), $420 (kit)

HIGHLIGHTS

- Included (factory-programmed) JR XG6 DMSS transmitter
- Attractive, sleek design
- Excellent flight performance

UNIQUE FEATURES

Featuring high-quality construction and engineering, the ready-to-fly version requires only a 2200mAh 3S LiPo flight battery and charger and four AA batteries for the transmitter. Also included in the box are a DVD, instructions, and Deans Ultra Plug connectors for your flight batteries.

The Ninja's main frame is constructed of stacked carbon-fiber plates with four square aluminum motor arms sandwiched

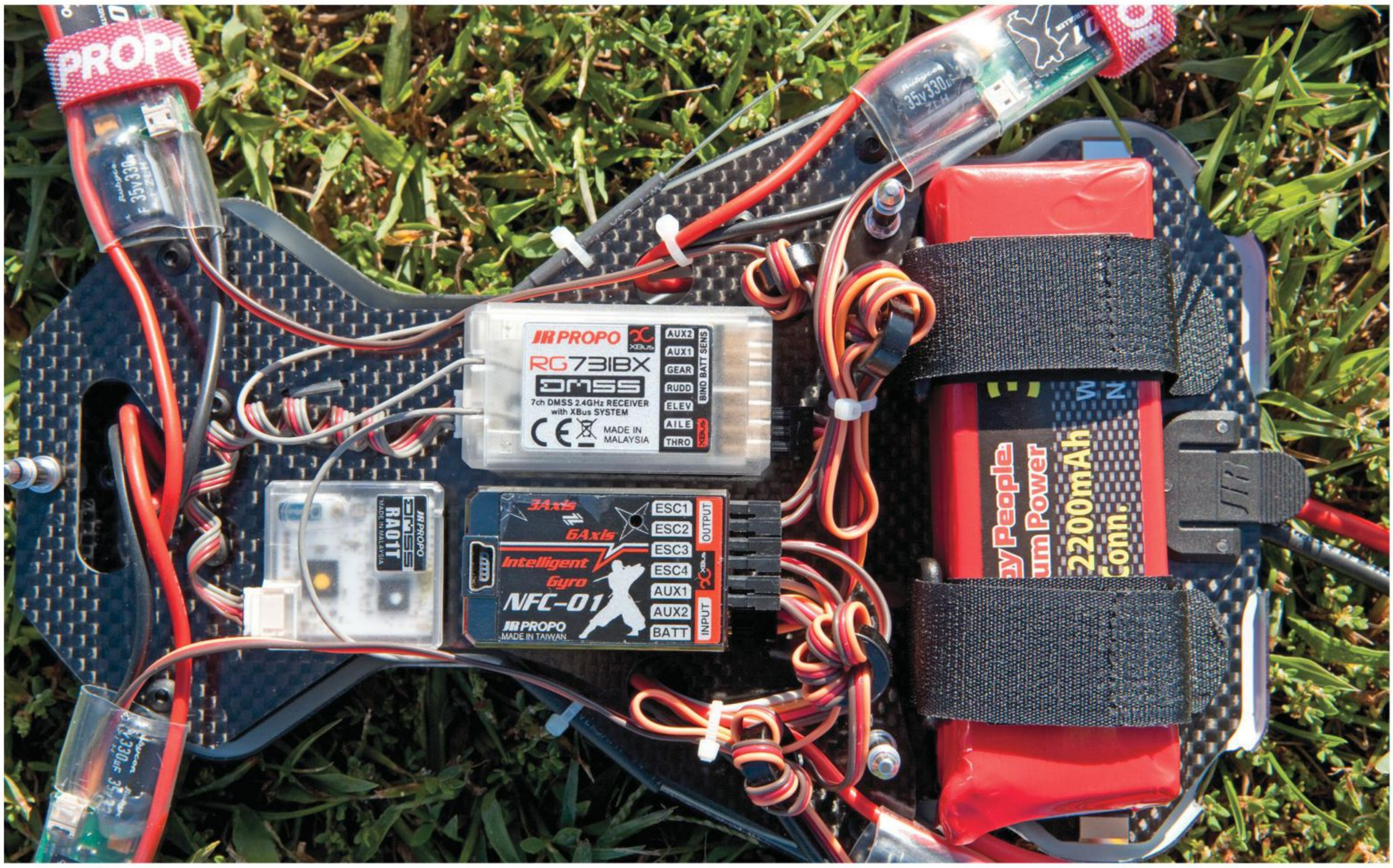
The Ninja's sleek and unique shape helps maintain orientation in the air.

between them. Rather than symmetrical arms, the two rear arms are longer and swept back, giving the Ninja a unique shape. Attached to each arm is a NJM-01 10P-1400Kv motor and its 18-amp speed control. The included six-axis gyro-stabilization flight-control system is the heart of the multirotor, and this controller will work only with an XBus DMSS receiver. A satellite telemetry module for the receiver voltage is also installed. The carbon-fiber battery tray slides into place and has a quick-release latch for speedy battery changes. A Deans Ultra Plug connector is factory installed, and two sets of mating connectors are supplied for soldering onto your LiPo batteries.

On the underside of the main frame is the BEC Power Control Board, which supplies 5.8 volts and 2.5 amps and has a red LED that is illuminated when the battery voltage gets low to tell you that it is time to land. All the electronics are neatly laid out and secured with either tie wraps or Velcro straps. The upper and lower Lexan canopy halves have a beautiful airbrushed finish. Similar to RC helicopters, the canopies are attached to the frame via aluminum posts and grommets, and secured with radio-control-car-style body clips.

IN THE AIR

Even though the Ninja is a fixed-pitch quadcopter, it has incredible 3D capabilities. It has a wide flight envelope:



JR's attention to detail can be seen in the neat layout of the receiver, flight controller, and telemetry module and their associated wiring.

from stable hover to all-out 3D aerobatics, including inverted hover. Its two flight modes—normal and 3D—are selectable via a switch on the transmitter. In the normal mode, the model is very stable in hover, making it suitable for beginners or new pilots. In the 3D mode, the Ninja shows its true colors and will satisfy expert 3D pilots. Aerobatic flight is made possible by the motors' ability to instantaneously reverse direction and the use of special propellers, which are symmetrical and work in either direction.

The only downside is shorter-than-normal flight times. This is because the props are less efficient than traditional ones and the Ninja requires more power. The speed controls consume a lot of juice when reversing direction. I was getting between four and five minutes of flight time per battery charge. The good news is that the Ninja uses a ubiquitous 3-cell 2200mAh LiPo, which is readily available at most hobby shops.

BOTTOM LINE

In normal flight mode, the Ninja 400MR is a great multirotor drone for novice pilots. In the 3D model, it will satisfy any seasoned 3D pilot looking for performance. With simple yet strong construction, the drone will easily survive the inevitable pilot errors during the learning curve.

Amazing 3D flight is made possible with the special props and brushless motors that have the ability to reverse direction.

TOTAL CONTROL

The ready-to-fly Ninja 400MR comes with a JR XG6 6-channel transmitter. The transmitter features DMSS (Dual Modulation Spectrum System) 2.4GHz transmission protocol and is JR XBus capable. Its features include 20-model memory, a micro-SD card slot, easy 3D jog-dial input, and advanced programming options, including flight modes. It comes programmed at the factory with all the settings you need for flying the Ninja.

Take off on water, land on grass.

water.

grass,

Seawind®

The Seawind lets you take off from a lake and land on solid ground – or vice-versa – easily and safely. No other R/C plane does both!

Loaded with features!

- **Mechanical retracts**
- **Fowler flaps**
- **Detailed cockpit**
- **Lighting system**
- **Brushless motor, ESC and servos**

Flyzone®

flyzoneplanes.com/135v

See it here!

Flyzone, a Hobbico company. HOBBICO


N1790


MULTIPLEX
www.multiplex-rc.de


SUPERROC
SUPERROC


EXTRA
300SP
EXTRA
300SP


Factor 3D
Factor 3D

UP, DOWN, AND ALL AROUND

FOUR ADVANCED AEROBATIC MANEUVERS

BY **JOHN GLEZELLIS**
ILLUSTRATIONS BY **FX MODELS**

From vertical and horizontal moves to turnaround maneuvers, when you start flying aerobatics, it's difficult to combine various elements and fly them both precisely and consistently. Let's take the loop, for example. While it may be fairly straightforward to perform a single loop, try flying a vertical 8, which is an inside loop followed by an outside loop. Place these maneuvers on top of each other, make sure they are the same size, and fly them in different wind conditions. Now, it isn't so simple! The maneuvers we'll discuss here—the reverse Cuban-8 with half rolls, the snap-rolling half circle, the vertical S, and the Figure 6 with half rolls—are all built on segments of more basic moves. With time, you can even take these more complex maneuvers and combine to create your own sequences. After all, that is the beauty of aerobatics.

FIRST THINGS FIRST

In the aerobatic world, a perfectly set-up aircraft helps the pilot focus on one thing: executing the maneuver. Once the airplane is well trimmed and performs to the pilot's liking, concentration can be given to flying different aerobatic figures rather than on the inputs needed to correct any undesired airplane tendencies. I love using "flight modes" on all my planes. This basically means that all dual and/or triple rates can be found on one switch. While other features exist (like the fact that separate mixes can be applied on each flight mode, separate trims can be applied to each mode, and so on), I use the term "flight mode" in its most basic form.

To perform a maneuver like the ones featured in this article, I only use my low-rate mode. I like to use low rates for all precise maneuvers, but you can always tweak certain modes to cater to new maneuvers. As you progress in your flying ability, you will perform more complex maneuvers and will have to adjust your rates and/or exponential values to perform them with utmost finesse. As a starting point, I recommend 15 degrees of aileron deflection with 20 percent exponential, 12 degrees of elevator deflection with 25 percent exponential, and 35 degrees of rudder deflection with 50 percent exponential for the low-rate setting. Because these are not 3D maneuvers, a minimum of 30 degrees of control-surface deflection is required on all control surfaces with a fair amount of exponential. Typically, a great starting point is about 40 percent. Exponential will soften how the airplane will respond to certain control inputs around neutral, but maximum travel can be obtained by moving the control stick to the maximum amount. Adding the wrong value of exponential will make the aircraft more sensitive around center stick, which is exactly the opposite of what we are trying to accomplish.

IN THE AIR

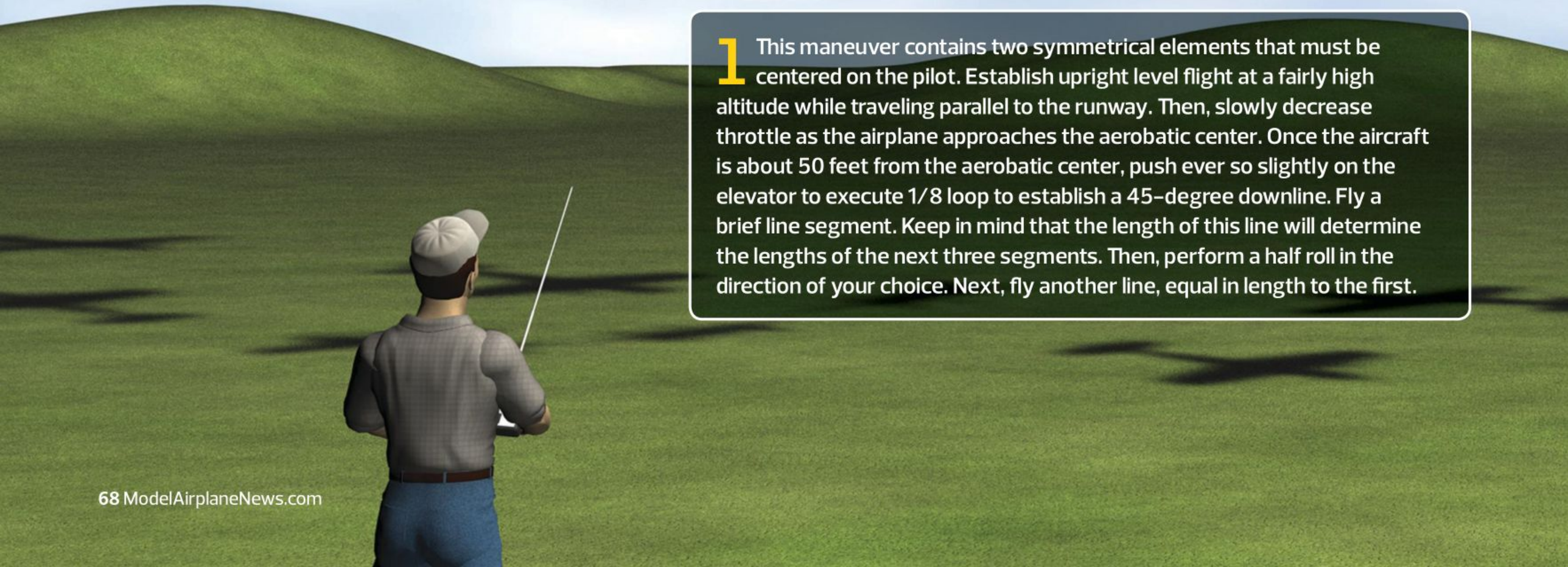
Once in the air, let's check control throws. The airplane should not feel overly sensitive while flying on low rates but smooth. At altitude, apply full aileron deflection. If the roll rate is too slow with the aileron stick at maximum deflection, increase the aileron dual-rate value. If it's too quick and you can't keep up, decrease the dual-rate value. Then try different exponential values so that you can make small corrections around neutral stick so that the airplane is not overly sensitive. Perform similar tests on the other control surfaces. On low rates, you should be able to sustain knife-edge, which will determine the amount of rudder deflection that's needed. You should also be able to pull full on the elevator stick and not have the airplane tip-stall.

As for throttle, pilots sometimes feel that their throttle response is too sensitive at certain throttle percentages. For example, do you feel like your throttle response is fairly linear from 0 to 60 percent, but there is little throttle change from 60 to 100 percent? If so, you may want to apply a throttle curve so that you can change the throttle percentage at various points. Done correctly, the throttle will respond in a linear fashion, which is my personal preference.

Flying the Reverse Cuban-8 with Half Rolls

Begin by climbing to a safe altitude, which for a typical 60-inch-span model is about 300 feet. Align the aircraft so that it is upright and parallel to the runway at about 40 percent throttle. When the airplane is about 50 feet in front of you, decrease throttle, push down-elevator, and establish a 45-degree downline. Fly a short line, and perform a half roll as the airplane passes directly in front of you. Fly another short line, equal to the first. Increase throttle to about 80 percent and push 3/4 of an outside loop to establish another 45-degree downline (decrease throttle after establishing the downline). Fly a short line (equal to the others) and perform another half roll. Fly another similar short line. Increase throttle to about 80 percent and push 5/8 of a loop to exit in upright level flight. As the airplane flies upright and level, decrease throttle to about 40 percent. Your plane should be at the same altitude in which it started the maneuver. It can help to count while flying the various line segments to keep them the same length. It's also important to fly at a constant speed. Now that you have a brief overview of the general control inputs that are required, let's explore this maneuver as well as a few key flight tips by breaking this stunt into four steps:

3 Fly a brief line on the 45-degree downline that is equal to the previous segments. Then, execute a half roll. This should be at the same roll rate as in the first half roll.



1 This maneuver contains two symmetrical elements that must be centered on the pilot. Establish upright level flight at a fairly high altitude while traveling parallel to the runway. Then, slowly decrease throttle as the airplane approaches the aerobatic center. Once the aircraft is about 50 feet from the aerobatic center, push ever so slightly on the elevator to execute 1/8 loop to establish a 45-degree downline. Fly a brief line segment. Keep in mind that the length of this line will determine the lengths of the next three segments. Then, perform a half roll in the direction of your choice. Next, fly another line, equal in length to the first.

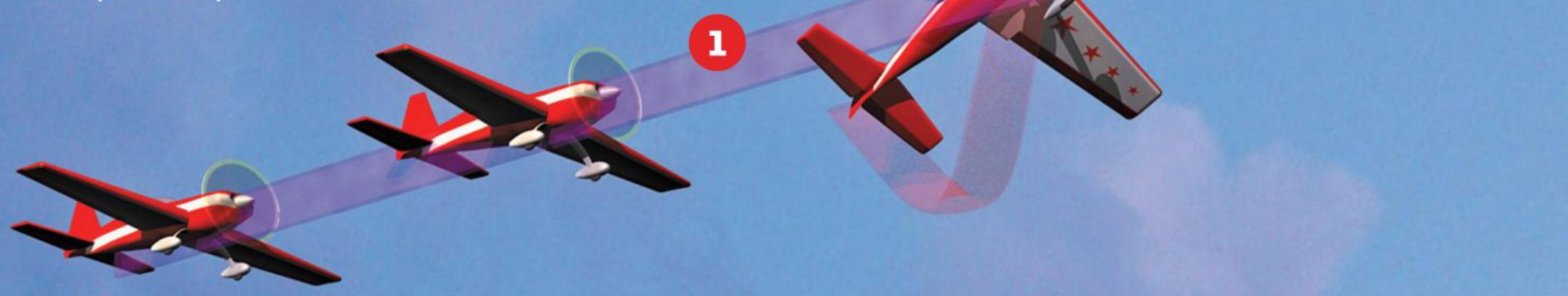
2 Perform a gentle 3/4 outside loop to establish a 45-degree downline. Apply throttle as needed to keep a constant flight speed. On your first attempt, I recommend that you use about 80 percent throttle on any segment that involves a climb and adjust the throttle setting accordingly. Remember, the goal is to keep the airplane flying at a constant speed.

4 Fly another line, the same length as before. When complete, push a 5/8 loop and exit in upright level flight. You have now successfully flown the reverse Cuban-8 from the top with half rolls!

Some situations might develop that need special attention and practice. For example, in a strong wind, the airplane might change heading. Make sure that the heading of the aircraft is exactly where you want it to be, and ensure that both loop segments are the same size and are round, as intended. Also, define the 45-degree lines, and center both half-rolls on the 45-degree lines. While these are the most common mistakes performed, they can separate a novice pilot from an advanced pilot.

Flying the Snap-Rolling Half Circle

While the power-to-weight ratio of each individual aircraft is different, most aerobatic airplanes are powered so that about 70 percent throttle is needed to execute this maneuver. For the first few attempts, you should perform this stunt parallel to the runway, into the wind, and at a generous altitude in case you become disoriented. After the aircraft passes you, which should be in the center of the flying field, activate the rates that you use to perform the snap roll. Initiate the snap roll by applying up-elevator and input rudder and aileron in the same direction. As the aircraft completes the first rotation, continue to hold maximum aileron deflection, but command different elevator and rudder amounts not only to maintain altitude but also to keep a constant turn radius while snapping. The goal is to perform a 180-degree circle with continuous positive snap rolls. Once the figure is complete, release inputs and establish upright level flight so that the aircraft is now traveling parallel to the runway but in the opposite direction. Let's simplify matters and divide this exciting figure into four separate steps:



1 For the first attempt, begin by lining up the aircraft to the runway so that it is traveling into the wind at a fairly high altitude and in upright level flight. As the aircraft passes you, initiate the positive snap roll by applying up-elevator and both rudder and aileron input in the same direction with about 70 percent throttle. Because the example illustration is done with a left positive snap roll, hold left aileron and rudder input. To maintain altitude, change elevator and rudder commands but hold aileron deflection at a constant amount throughout the figure.

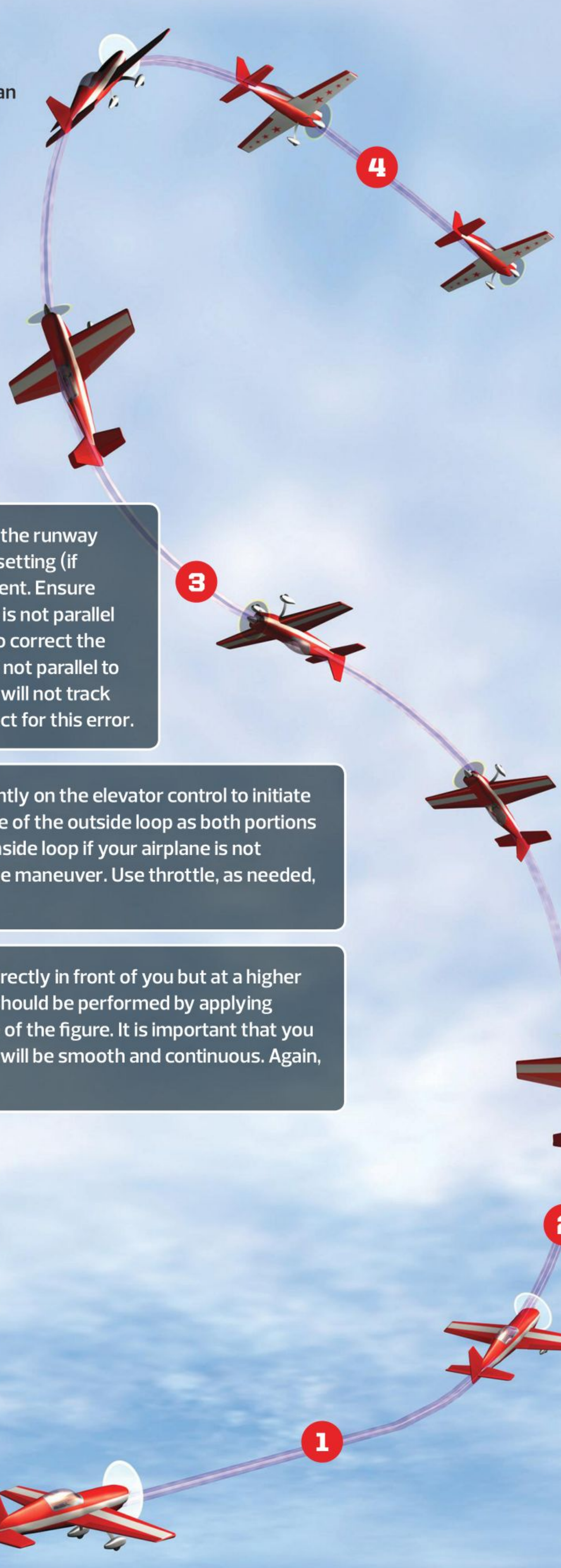
2 To begin the circle portion of the figure, apply more up-elevator deflection when the aircraft is banked in a way that will allow it to be "pulled" around the radius. Similarly, this will be done when the aircraft is inverted. As the airplane is inverted, apply small amounts of down-elevator, and release rudder input to some degree if the airplane becomes too "deep" in yaw throughout the snap roll.

3 Change the throttle setting as needed to maintain a constant flight speed throughout the figure. Continue to hold full left aileron while changing the rudder and elevator deflection amounts to maintain a perfect 180-degree circle. Proper control-input timing is essential, and only small amounts of elevator deflection should be given.

4 As the aircraft approaches the completion point, hold larger rudder amounts with full left aileron input and focus only on both elevator and throttle amounts. Once the aircraft has completed the 180-degree circle, neutralize all control inputs so that the airplane is in upright level flight. You may have difficulty in applying the proper aileron, elevator, rudder, and throttle commands needed to maintain a constant turn radius. When you are new to a maneuver like this, it might help to decrease control deflection to allow more time in the maneuver. If the roll rate is too quick, for example, decrease the aileron rate. Similarly, if the aircraft becomes too deep in pitch and/or yaw, decrease the elevator and/or rudder deflection amount. As you become more proficient, you can gradually increase the aileron, rudder, and elevator deflection amounts that are needed to fly this stunning stunt.

Flying the Vertical S

The entry altitude should be at your typical flying height as a fair amount of altitude will be gained. For a 60-inch-span airplane, an entry altitude of 150 feet is more than sufficient. When ready, orient your model parallel to the runway and increase throttle to about 90 percent. While this will vary depending on the power-to-weight ratio of your aircraft, it is applicable to most setups. As the airplane is directly in front of you, initiate the first half inside loop. Then, when the airplane has completed the half inside loop and is in front of you but now inverted and traveling in the opposite direction, immediately perform a half outside loop. No line segment should exist between the two loop segments, and it is important to keep the two loop segments the same size. Once complete, the airplane will be traveling in the same direction that it entered the maneuver but at a much higher altitude for the exit. Now, let's examine the control inputs needed, and divide this maneuver into four easy steps:



1 Orient your aircraft in a manner so that it is traveling parallel to the runway in upright level flight. Make sure that you are on your low-rate setting (if using dual or triple rates), and increase the power to about 90 percent. Ensure that the wings of the aircraft are perfectly level, and if the airplane is not parallel to the runway, make any necessary rudder and/or aileron inputs to correct the heading. This will greatly decrease your workload; if the airplane is not parallel to the runway and only elevator input is applied for the loop, the loop will not track properly from the start and will need more complex inputs to correct for this error.

2 As the airplane is directly in front of you, pull back ever so slightly on the elevator control to initiate the half inside loop. The size of this loop will determine the size of the outside loop as both portions of the maneuver must be equal. Do not make an extremely large inside loop if your airplane is not overpowered as you may run out of speed on the second half of the maneuver. Use throttle, as needed, to maintain a constant flight speed.

3 As soon as the first loop is complete, the airplane should be directly in front of you but at a higher altitude. As soon as the airplane is inverted, the outside loop should be performed by applying down-elevator instead of up. Cater the elevator input to the shape of the figure. It is important that you perform all inputs in a smooth manner so that the aerobatic figure will be smooth and continuous. Again, no line segment must be visible between the half loops.

4 Once your aircraft establishes upright level flight, you have completed the vertical S. Now, decrease throttle to about 75 percent, and prepare to give this maneuver another try! While this might appear to be a fairly simple maneuver, it might take some time to fully master it. For example, the airplane should not drift with the wind throughout the maneuver, and because this is a fairly large stunt, it might. You must concentrate on heading. If you started this maneuver 50 feet away from yourself on the edge of the runway, it should be at that same distance but at a much higher altitude once complete. If a strong crosswind exists, you may have to lean the airplane into the wind so that the flight path remains constant and parallel to the runway. To do this, rudder corrections will need to be made as well as small aileron inputs to keep the airplane from drifting with the wind. Now, focus on doing all of this while maintaining a perfectly executed vertical S! As you can see, this might be quite tedious.

1 While the aircraft is traveling at a fairly high altitude into the wind and parallel to the runway, decrease the throttle and gently push to a vertical downline and fly a brief line. To ensure that your lines are equal, it often helps to count "1, 2" during each segment.

2 Next, perform a half roll at a moderate roll rate and fly another line, equal in length to the first. Again, count out "1, 2." Note that your count will work only if the speed of the aircraft is constant! Make any necessary rudder corrections to keep the flight path of the airplane parallel to the runway.

Flying the Figure-6 with a Half Roll

Known as a turnaround maneuver, this move is used to change the direction in which your airplane is traveling. During the maneuver, you should orient the aircraft parallel to the runway, flying upright at an altitude of about 400 feet. The altitude will differ depending on the size of the model being flown, but an altitude of 400 feet will suffice for a 60-inch-span aircraft. After you've established the heading, perform a 90-degree push to establish a vertical downline, where you'll fly a brief line segment. You'll fly a half roll during another line segment, equal in length to the first. The aircraft will then execute a 3/4 outside loop and exit the maneuver in upright level flight in the opposite direction in which it started. This maneuver can be divided up into four steps:

4 Once complete, the aircraft must be traveling in upright level flight but in the opposite direction compared to the entry. Throughout the maneuver, various aileron, elevator, and rudder corrections will be required; apply these inputs as needed to keep the airplane properly positioned.

To perform this maneuver well will require practice, patience, and the proper aircraft setup. Pilots often have difficulty with line segments not being of the same length and might have loops that are not round or a half roll that isn't centered on the downward segment of the maneuver. Also, wind can often become a troubling factor. Regardless of the wind direction, the flight path of the model should always be either parallel to the runway during the entry and throughout the 3/4 loop or perpendicular to the runway during the downline segment with a half roll. If this isn't done correctly, the airplane can easily be pushed to an undesired heading.

3 At this point, increase throttle as you begin the push for the 3/4 outside loop segment. Throttle input will vary depending on the power-to-weight ratio of the aircraft, but it is safe to say that about 75 percent throttle should be used as soon as the airplane is inverted and passing the 90-degree segment of the 3/4 loop, which is a total of 270 degrees.

FINAL THOUGHTS

It is important that you don't become frustrated when trying new maneuvers as consistency comes with time and practice. Before taking to the skies, think about the new maneuver that you're going to perform in detail and know what control inputs will be required. When you're trying out a new move, it might not look pretty at first but continue to practice until it looks perfect. And of course, always remember to have fun.

ROTOR SPEED

BY **PAUL TRADELIUS**

All rotor blades use an airfoil to develop lift, which defines the handling and flight characteristics of the helicopter. Although all our rotor blades are now buy-and-fly, it is still important to understand some basic airfoil principles.

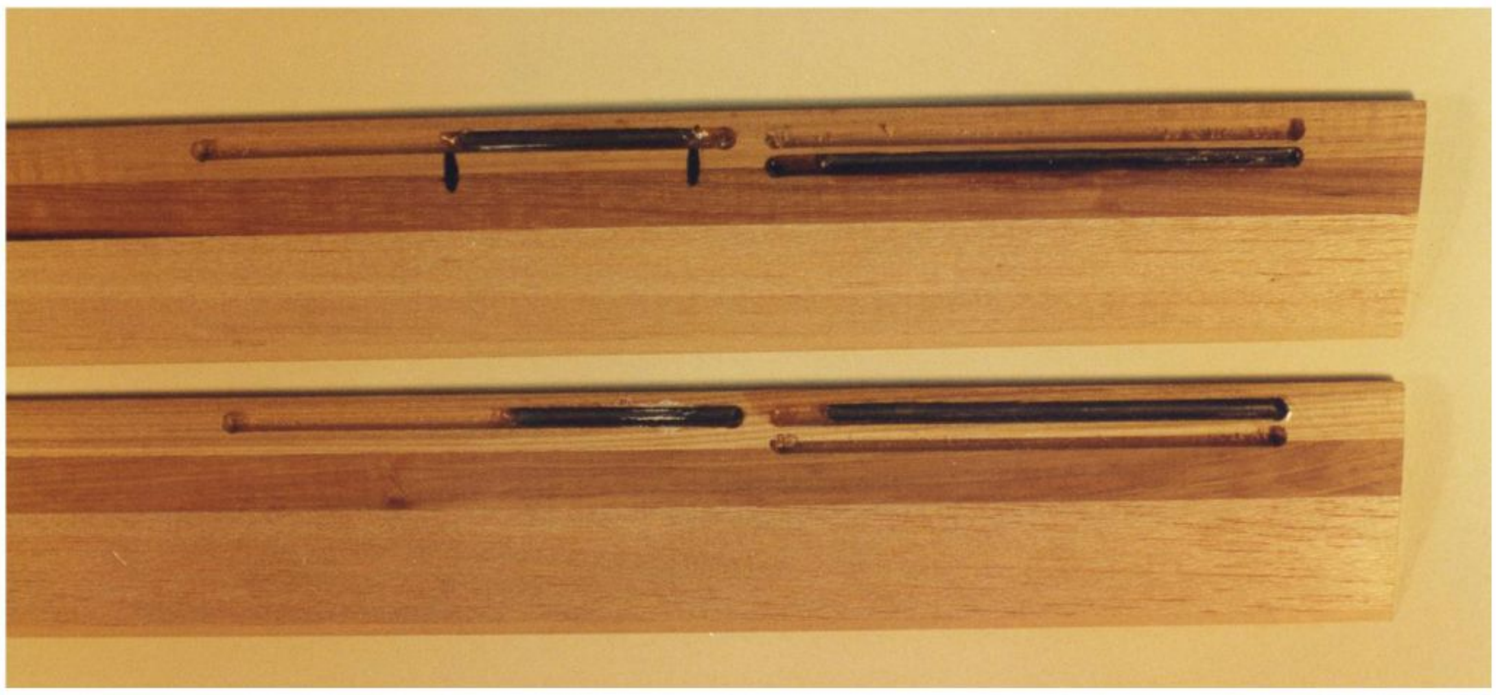
Rotor Blades: Basic Airfoil Aerodynamics

Progress is making our life, and our hobby, a lot easier. As an example, when we want a new set of rotor blades, all we have to do is specify the size and choose from several fiberglass blades that are bolt-on and ready to fly. For the average modeler, this is actually what he wants and suits his needs very well. This bolt-on-and-ready-to-fly mentality, however, has put some distance between the modeler, his helicopter, and his overall hobby. Therefore, in this column, I will present some basic airfoil aerodynamics to help you better understand your rotor blades, which you may use to refine future rotor-blade choices.

HISTORY LESSON

Years ago, we did not have ready-to-fly, bolt-on, fiberglass rotor blades. First, we had to decide what type of airfoil we wanted, and there were many to choose from. We had a choice of a flat-bottom airfoil, a semi-symmetrical or full symmetrical airfoil, a reflex airfoil, and probably one or two more that have escaped my memory. All rotor blades were made out of wood and came in kit form to be finished, covered, assembled, and balanced by the pilot. If you think this process required a lot of thought, work, and technique, you are right. Besides all the work, another disadvantage of these wooden rotor blades was that the airfoil had to be rather thick for the wood to provide the strength needed to handle the flight loads of the rotor disc.

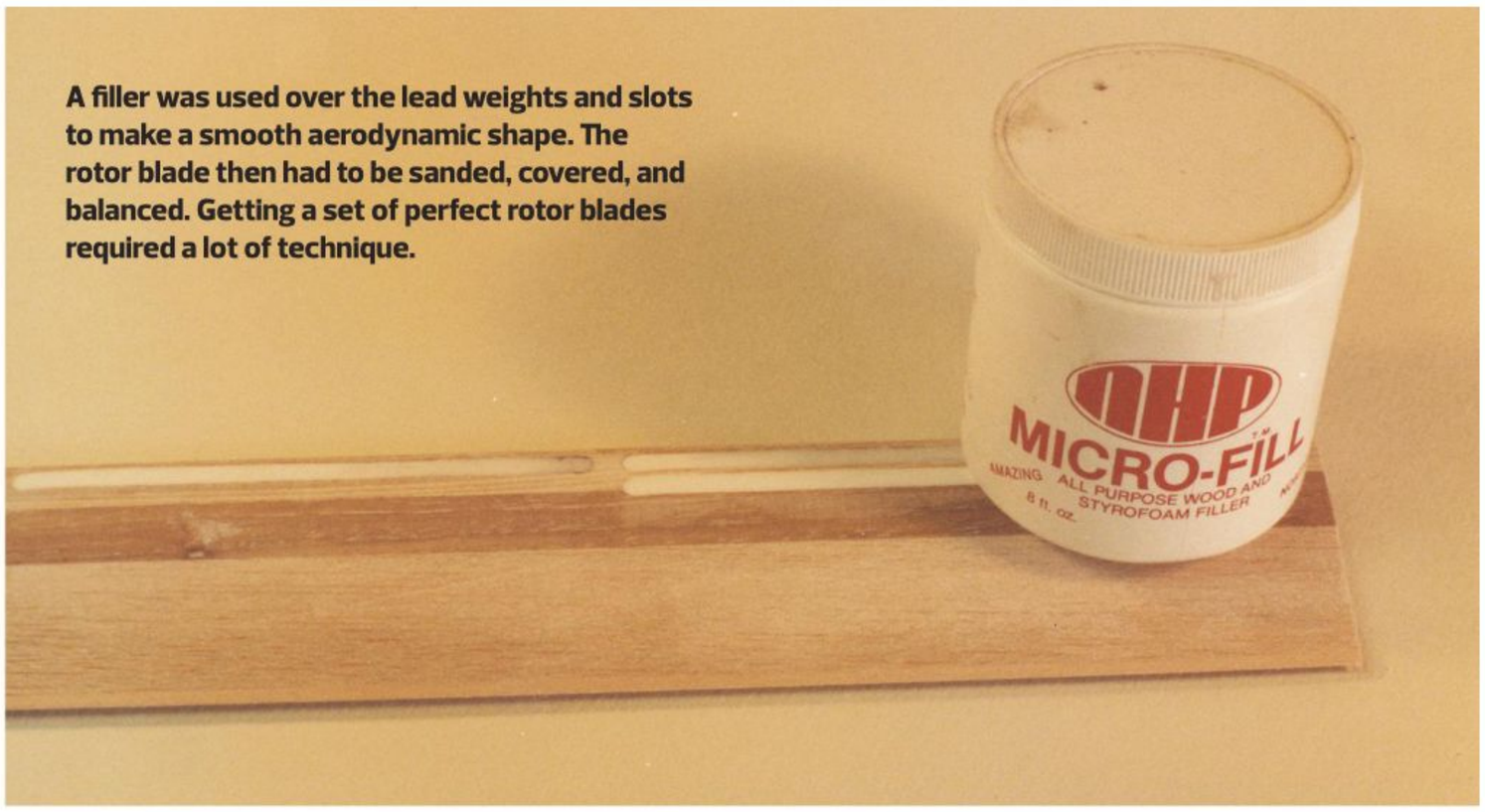
These wooden blades, however, also offered some advantages we no longer have today. As I mentioned, we could choose the type of airfoil we wanted for our helicopter. If you were flying a scale helicopter, then a flat-bottom or reflex airfoil would work well for maximum lift. Full symmetrical airfoils were also available for aerobatics and more advanced flying. We could choose not only the length of the blades but also the chord and type of blade tip that would work best. A short stubby rotor blade was good for aerobatics,



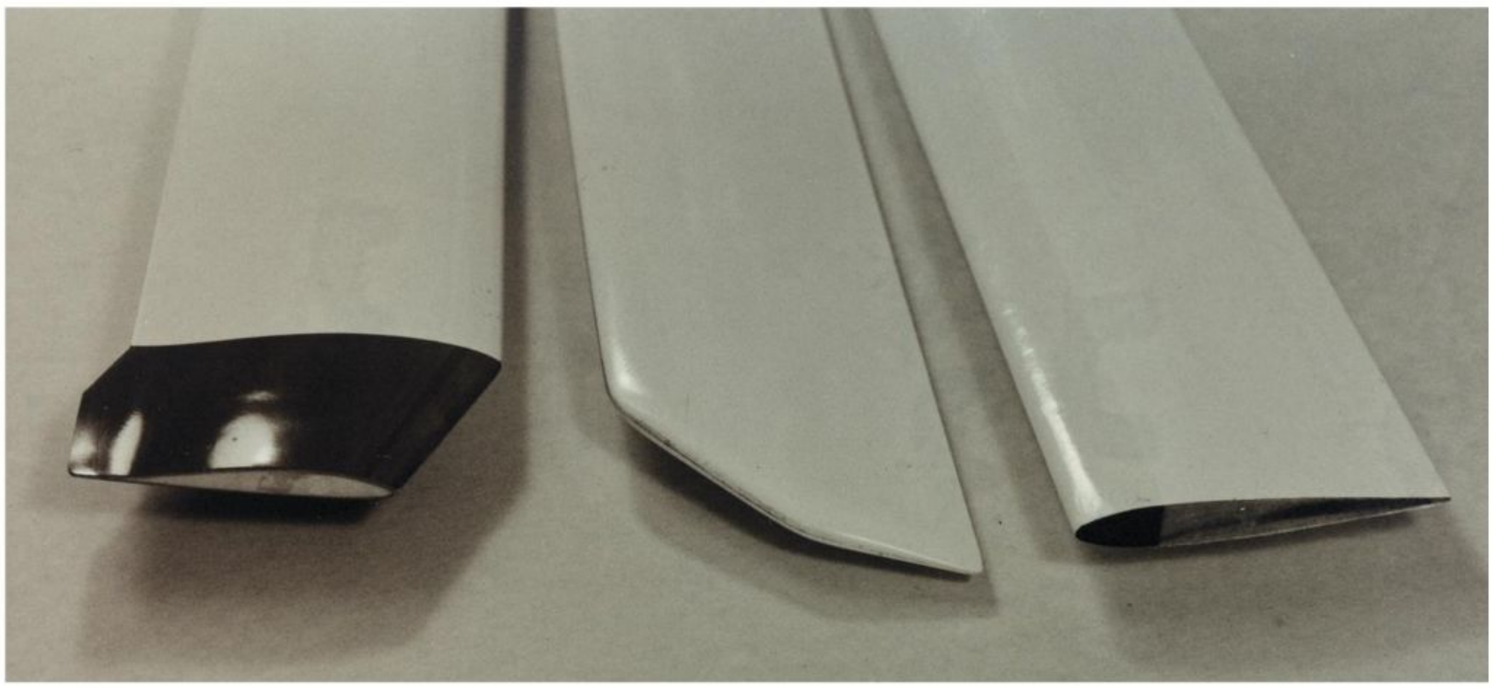
Years ago, rotor blades were made out of wood and came in kit form. Pilots could choose a specific airfoil, and slots were provided to accept lead weights that were used to fine-tune the flight characteristics of the helicopter.

while a longer blade was better for scale, and an angled blade tip was thought to reduce tip drag. Then, on top of all this, we had to adjust the weight of the blade for our flying style. Strips of thick lead wire were provided, and the blade was cut to accept the desired amount of weight you decided to use. More weight, placed closer to the leading edge, would make the blade (and the helicopter) very stable, while a lighter blade with less weight, placed farther from the leading edge, would make the helicopter more maneuverable. And as you can imagine, this required a lot of experimentation. I remember that, one time, I wanted to see how a heavy blade with weight close to the leading edge would do when performing a loop. The helicopter went up all right, but it was so stable on the back side that it did not want to pull out, and I just barely missed the ground. Experiment over.

Now, let's take a look at some basic aerodynamic terms that apply to our rotor blades.



A filler was used over the lead weights and slots to make a smooth aerodynamic shape. The rotor blade then had to be sanded, covered, and balanced. Getting a set of perfect rotor blades required a lot of technique.



The first fiberglass rotor blades became available with a variety of tips to reduce drag and improve the flight characteristics of the helicopter. They still had to be balanced, however.

AERODYNAMIC TERMS

Airfoil: any surface designed to produce lift when air passes over it. This includes not only our rotor blades but also the wings and propeller of an airplane. As we already discussed, these airfoils can have various shapes, including a flat-bottom, a semi-symmetrical, or a full-symmetrical airfoil for inverted flying. Because most helicopters today are fully aerobatic, the full-symmetrical airfoil is the most popular, although other airfoils can be found for other types of flying.

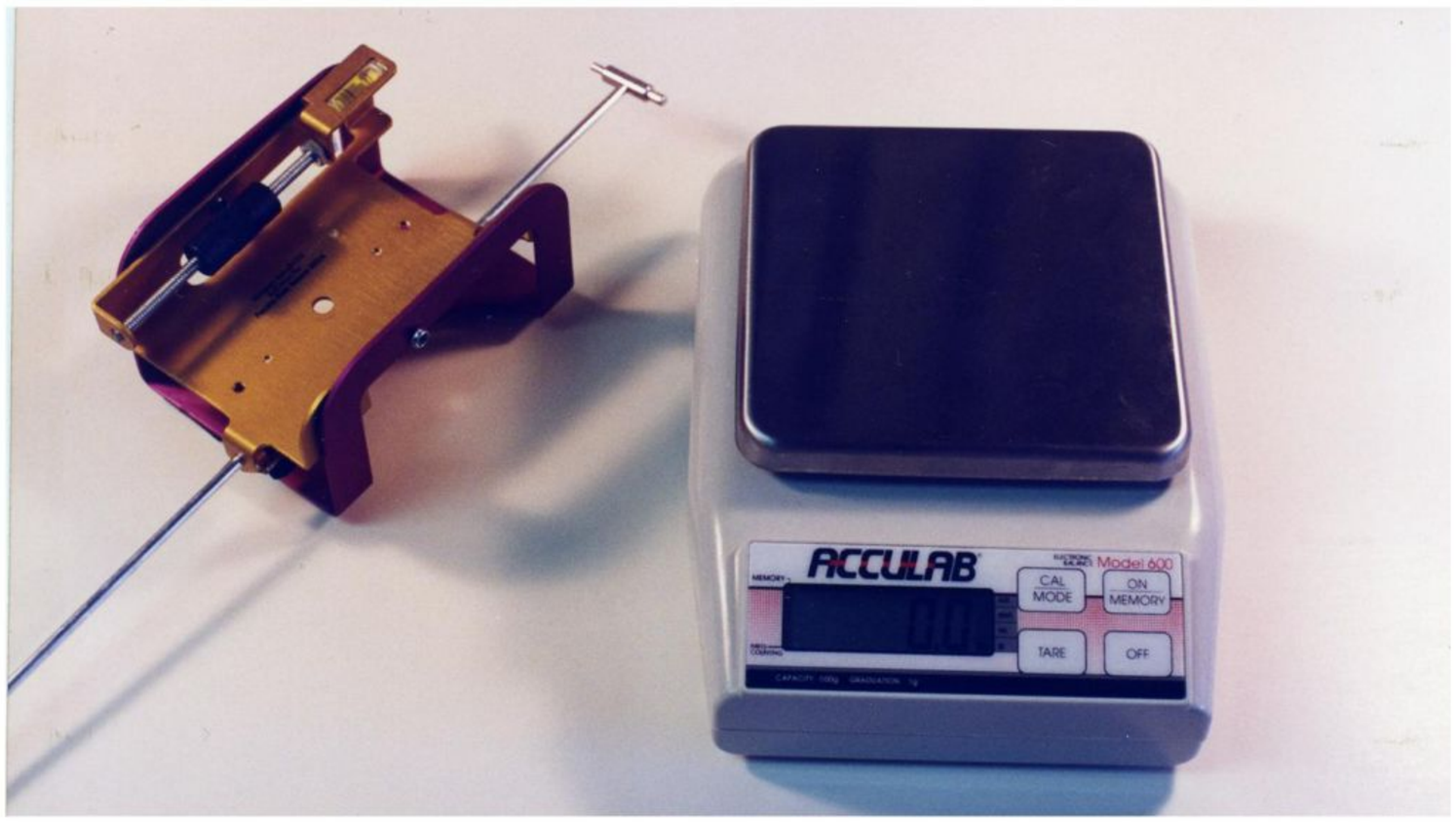
Chord, or chord line: an imaginary straight line from the leading edge to the trailing edge of the airfoil, which is used to measure the angles mentioned below with the help of a pitch gauge. The chord of a rotor blade is easily measured with a ruler, and if you have several sets of rotor blades, I'm sure you will find that they do not have the same chord, even though they could be the same overall length. This is because each blade manufacturer will vary the

The Next Best Thing

SKS Video Productions has just released its video of the 2015 IRCHA Jamboree, which was held at the AMA National Flying Site in Muncie, Indiana, this past August. Unfortunately, I was not able to attend this year's event, but watching this video is the next best thing to actually being there. Although at one hour and 42 minutes long, the video is too long to describe adequately here, I was impressed with the large number of scale helicopters, especially Stan Kopreski's Sikorsky H-34 monster, which weighs in at a whopping 47 pounds. Sandy Jaffe also flew a counter-rotating helicopter, which eliminated the need for a tail rotor. It was also nice to see that we are getting some youngsters into our hobby. Caleb Turner and Zaid Still are both nine years old, but they fly like seasoned veterans. I was trying to keep up with them, but I just can't seem to get my fingers to move that fast. The DVD is available in standard format and Blu-ray for $19.95, and an online streaming version is $4.99. sksvideo.com

The IRCHA Jamboree, held every summer at the AMA headquarters in Muncie, Indiana, is best seen in person. If that is not possible, however, then watching the video from SKS Video Productions is the next best way to capture all the excitement. (Photo by Jim Ryan)

ROTOR SPEED



Before the modern buy-and-fly fiberglass rotor blades, the Koll Rotor Pro Balancer and a digital gram scale were standard balancing equipment. This balancer is the best, but it is now hard to find.

chord to maximize the performance of its particular rotor blades.

Angle of attack: the angle between the chord line and the wind. Although this angle is important when discussing fixed-wing performance, we are generally more interested in the pitch angle of the rotor blade.

Pitch angle: the angle between the chord line and the reference plane determined by the main rotor disc. This is the angle of the rotor blade that most concerns us, and is easily measured with a pitch gauge. If the pitch angle is insufficient, there will not be enough lift, while too much pitch will cause the rotor blade to stall, resulting in excessive drag and a severe reduction in lift. It, therefore, becomes important to have the pitch angle properly adjusted to obtain the desired helicopter performance. Here are some general reference pitch angles that have served me well throughout the years and that you can use as a starting point when setting up your new helicopter.

- **Normal flying:** –2 to +10 degrees. An angle of –2 degrees should allow the helicopter to descend nicely while maintaining rotor speed, and 10 degrees should allow the helicopter to climb out without producing so much drag that the rotor speed will suffer. A helicopter will normally hover with about 3 to 4 degrees of pitch, so this pitch range places the hover collective at about midstick.
- **Aerobatics:** –10 to +10 degrees. Again, the rotor blades should be able to handle 10 degrees in either direction to produce a large amount of lift without decaying the rotor speed. Larger pitch ranges can also be used depending on the available power and the need for more aggressive maneuvering.
- **Autorotations:** –5 to +14 degrees. An angle of –5 degrees will allow the helicopter to descend rapidly, especially if overshooting the landing zone. An angle of 14 degrees is close to the stalling angle of attack of most rotor blades and is needed for maximum lift during the flare and landing.

Lift versus airflow: It's no secret that the faster we can turn the rotor blades, the more lift they will produce. There are practical limits to rotor speed, however, depending on the application. For those of you interested in scale helicopters, it's nice to keep the rotor speed in the 1,200rpm to 1,400rpm range for a full scale effect. For general flying, however, especially for nitro-powered helicopters, 1,500rpm to 1,800rpm is a nice range. And for the all-out 3D flying of superpowerful electric helicopters, it seems that all the rotor speed you can get is now the norm.

Lift versus air density: Lift varies directly with the change in air density. I live in Florida at sea level, where the air is as dense as it can get. As you move higher in altitude, however, that air also decreases in density, which also decreases the lift of the rotor system. At 10,000 feet, for example, the air is only two-thirds as dense as it is at sea level, so if the helicopter is to maintain its lift, the angle of attack of the rotor blades must be increased. But this will also increase the drag of the rotor system, requiring more power to maintain the desired rotor speed. And even when flying at your normal field altitude, atmospheric day-to-day changes in temperature, pressure, or humidity will vary the performance of your helicopter.

TOWER HOBBIES®

The World's Largest Selection of the Finest R/C Products. All at Low, Low Prices!

Give the Gift of RC!

- Request our annual catalog with over 7,000 products for just $3.00 and we'll send you a FREE $10.00 Coupon.
- Request a FREE Tower Talk sale flyer through our web site or by phone.
- When calling for a Tower Talk or a Catalog Refer to Department MAN

Sign Up For Our Email Newsletters at:
towerhobbies.com

- Special, money-saving offers!
- New product announcements!
- Special buys, closeouts, inventory reduction savings!

SAVE $30

with your order of $250 or more made during December!
Use Coupon Code **09018** when ordering.

Expires December 31, 2015

Only one Coupon Code per order please.
Not retroactive and not applicable to drop-ship items.

Follow us on:

WANT TO SAVE MORE?

Join the TOWER HOBBIES® #1 SUPER SAVER CLUB

ML1001
1 Year Membership
only $9.99

Tower Hobbies® LOW-PRICE Policy

If another company's advertised price for an item in this magazine is lower than Tower Hobbies, we will do our best to match it. However, we cannot honor another company's price on closeout, discounted or currently out-of-stock items, or prices due to typographical error or other special circumstances.

INTERNATIONAL ORDERS ACCEPTED

Just Starting Out?

Tower Hobbies, your get started headquarters

Tower Hobbies EASYRC.COM

Estes® Proto-X™ FPV HD Micro Quad RTF

Diagonal Measurement: 6.5 in (161 mm)
Requires: **4 "AA" batteries**

$179.97
ML1002

EASY PAY 3 PAY $59.99 ON REQUEST

Origin Aircraft

ALL NEW!

Wilga-2000 ARF
Wingspan: 52.4 in

Acro Vectored Thrust ARF
Wingspan: 44.1 in

$20 GIFT CERTIFICATE
use stock # below

ML1003	Acro Vectored Thrust 4S EPO ARF 44"	*$20 Gift Cert. NEW!* 3 PAY 58.33	$174.99
ML1004	Skyhunter FPV Kit 71"	*$20 Gift Cert. NEW!* 3 PAY 43.33	129.99
ML1005	Wilga-2000 Brushless ARF 52.4"	*$20 Gift Cert. NEW!* 3 PAY 58.33	174.99

XIRO Xplorer Ready-to-Fly Brushless FPV Drones

ALL NEW!

Diagonal Dimension (all): 350 mm (13.75 in)

Xplorer V RTF w/HD Camera

ML1091	Xplorer RTF	*NEW!* 3 PAY 166.66	$499.98
ML1092	Xplorer G RTF w/3-Axis Gimbal for GoPro	*NEW!* 2 PAY 349.99	699.98
ML1093	Xplorer V RTF w/HD Camera	*NEW!* 2 PAY 399.99	799.98

Heli-Max® FORM500 Utility Drone RTF

NEW!

Size: 500 mm (19.7 in) diagonally
Weight: 1384 g (49 oz) RTF
Requires: **Four "AA" batteries.**

$549.99
ML1094

EASY PAY 3 PAY $183.33 ON REQUEST

Graupner® Alpha 250Q HoTT Brushless Quadcopter

up to a $30 GIFT CERTIFICATE
use stock # below

Diagonal: 250 mm (9.8 in)

ML1009	ARF w/Receiver	*$25 Gift Certificate* 3 PAY 149.66	$448.98
ML1010	RTF	*$30 Gift Certificate* 2 PAY 299.49	598.98

Hubsan® X4 Pro Ready-to-Fly Brushless FPV Quads with Camera

Specifications (both):
Diagonal: 370 mm
Weight (w/o accessories): 1.06 kg (2.3 lb)
Max. Takeoff Weight: 1.42 kg (3.1 lb)
Flight Time: 25-30 minutes
Operating Range: 500 meters

X4 Pro Deluxe FPV Brushless RTF

$1499.99
ML1011

$799.98
ML1012

EASY PAY 2 PAY $399.99 ON REQUEST

X4 Pro FPV Brushless RTF

let your imagination soar

Hacker Models

ALL NEW!

HotWing 1000 EPP EVO 02
Wingspan: 39.4 in

HotWing Mini 500mm EPP Violet
Wingspan: 19.7 in

Extra 330SC EPP Yellow
Wingspan: 19.7 in

ML1013	HotWing Mini 500mm EPP ARF Violet 19.7"	*NEW!*	$24.99
ML1014	HotWing 1000 EPP ARF EVO 02 39.4"	*NEW!*	37.99
ML1015	Extra 330SC EPP ARF 1200mm Yellow 47.2"	2 PAY 47.49 *NEW!*	94.98

Enter stock numbers from this ad into the search box at towerhobbies.com for product specifications and requirements.

Dromida™ Quadcopter RTFs

GREAT gifts!

KODO™
Diagonal: 105 mm (4.1 in)

Vista UAV
Diagonal: 251 mm (9.8 in)

ML1016	KODO Quadcopter RTF w/Camera	2 PAY 29.99	$59.98
ML1017**	Vista UAV Quadcopter RTF	2 PAY 39.99	79.98

Flyzone® Sensei Trainers with WISE™ Gyros

Wingspan (both): 58 in

WISE FLIGHT STABILIZATION

with Bailout Switch for extra insurance!

ML1018	Sensei FS EP Trainer RTF w/WISE Gyro 58"	3 PAY 99.99	$299.97
ML1019	Sensei FS EP Trainer Rx-R w/WISE Gyro 58"	3 PAY 66.66	199.98

$29.99 ML1020**
Proto-X™ Nano Quadcopter RTF

GREAT gifts!

Buy more than one and fly them together!

$39.99 ML1021**
Proto-X™ Nano Quadcopter SLT RTF

Estes® Quadcopters

- ***The world's smallest quadcopters!***
- ***Diagonal Length: 1.8 in!***

Diagonal: 50 mm (2.0 in) • **Weight:** 11.5 g (0.4 oz)
Proto-X requires: 2 "AAA" batteries
Proto-X SLT requires: 4 "AAA" batteries

Ehang® GHOST™ Aerial Drone RTF

No Radio Required!

Diagonal: 360 mm (14.2 in)

Camera not included.

ML1022**	RTF Android		
ML1023**	RTF iOS		

$749.98 each

EASY PAY 2 PAY $374.99 ON REQUEST

Android is a trademark of Google Inc. IOS is a trademark or registered trademark of Cisco in the U.S. and other countries. Requires Android 3.0 or later or iOS 6.0 or later (Apple). Compatible with iPhone, iPad and iPod Touch.

Tower Hobbies® 1/5 Piper J-3 Cub 40 GP ARF

Wingspan: 81 in

$179.97 ML1024

EASY PAY 3 PAY $59.99 ON REQUEST

Flyzone DHC-2 Beaver Brushless Float Planes

DCH-2 Beaver Tx-R

Wingspan (all): 59.5 in

Island Wings DHC-2 Beaver Rx-R

ML1025	DHC-2 Beaver RTF 59.5"	3 PAY 99.99	$299.97
ML1026	DHC-2 Beaver Tx-R 59.5"	3 PAY 69.99	209.97
ML1027	Island Wings DHC-2 Beaver Rx-R 59.5"	3 PAY 66.66	199.98

Phoenix Models GP/EP ARFs

ALL NEW!

Super Cub PA-18
Wingspan: 90.5 in

Tiger 3
Wingspan: 70.8 in

T-34 Mentor
Wingspan: 63.8 in

ML1028	Super Cub PA-18 20cc GP/EP ARF	*NEW!* 3 PAY 133.33	$399.99
ML1029	Tiger 3 GP/EP ARF	*NEW!* 3 PAY 59.99	179.97
ML1030	T-34 Mentor GP/EP ARF	*NEW!* 3 PAY 96.66	289.98

Tower Hobbies Kaos .60 GP/EP ARF

NEW!

Wingspan: 62 in

$179.97 ML1031

EASY PAY 3 PAY $59.99 ON REQUEST

Great Planes® Escapade GP/EP ARFs

Escapade Sport
Wingspan: 52.5 in

Escapade MX
Wingspan: 80 in

Escapade .61
Wingspan: 68 in

ML1088	Escapade .40-.56 Sport GP/EP ARF 52.5"	3 PAY 43.33	$129.99
ML1089	Escapade .61 GP/EP ARF 68"	3 PAY 63.33	189.99
ML1090	Escapde MX GP/EP ARF 80"	3 PAY 99.99	299.97

Wingspan: 47.5 in

NEW!

Great Planes Twinstar EP ARF

$139.98 ML1035

EASY PAY 3 PAY $46.66 ON REQUEST

ORDER ONLY 1-800-637-4989 • ORDER ASSISTANCE 1-800-637-6050 Refer to ad #09001 2

TOWER HOBBIES®

Tower Hobbies® Brushless Rx-R™ Warbirds

F6F Hellcat Rx-R
Wingspan: 39 in

F4U Corsair Rx-R
Wingspan: 39 in

P-51D Mustang Rx-R
Wingspan: 40 in

ML1036	P-51D Mustang Rx-R 40"	$119.98 each	EASY PAY 2 PAY $59.99 ON REQUEST
ML1037	F4U Corsair Rx-R 39"		
ML1038	F6F Hellcat Rx-R 39"		

Helimax® Voltage 500 3D Brushless Stunt Quadcopter Rx-R™

Diagonal: 500 mm (19.7 in)

$429.99 ML1039

EASY PAY 3 PAY $143.33 ON REQUEST

Dromida Ominus FPV UAV Quadcopter RTF

4 colors available!

Diagonal: 238 mm (9.4 in)

GREAT gift!

$149.97 ML1040**

EASY PAY 3 PAY $49.99 ON REQUEST

Traxxas® LaTrax™ Alias™ Electric RTF

Rotor Dia.: 5.5 in
Length: 6.5 in
Blade Circle: 14.8 in

$99.95 ML1048**

EASY PAY 2 PAY $49.98 ON REQUEST

ML1049 Alias 720p Camera $49.95

DLE Gasoline Engines

ML1041	DLE-20cc Gas	3 PAY 83.33	$249.99
ML1042	DLE-30cc Gas Rear Carb w/EI & Muffler	3 PAY 94.99	284.97
ML1043	DLE-61cc Gas w/Electronic Ignition	3 PAY 149.99	449.97
ML1044	DLE-120cc Twin Gas w/Electronic Ignition	2 PAY 374.99	749.98
ML1045	DLE-20RA Gas Rear Exhaust w/Electronic Ignition	3 PAY 94.99	284.97
ML1046	DLE-35RA Gas Rear Exhaust w/Electronic Ignition	3 PAY 116.66	349.98
ML1047	DLE-55RA Gas Rear Exhaust w/Electronic Ignition	3 PAY 139.99	419.97

RF7.5 REALFLIGHT™ Simulator

REALFLIGHT DRONE Simulator NEW!

up to a $30 Mail-In Rebate Certificate

Manufacturer's Mail-In Merchandise Rebate Certificate
on Select RealFlight 7.5s use stock # below
Download your manufacturer's mail-in merchandise certificate form at towerhobbies.com/rebates

See realflight.com for information and complete system requirements.

$30 Mail-In Rebate Certificate

w/TTX610 Radio and Wireless Interface

$30 Mail-In Rebate Certificate

w/Interlink Elite Mode 2

$20 Mail-In Rebate Certificate

w/Wireless Radio Interface

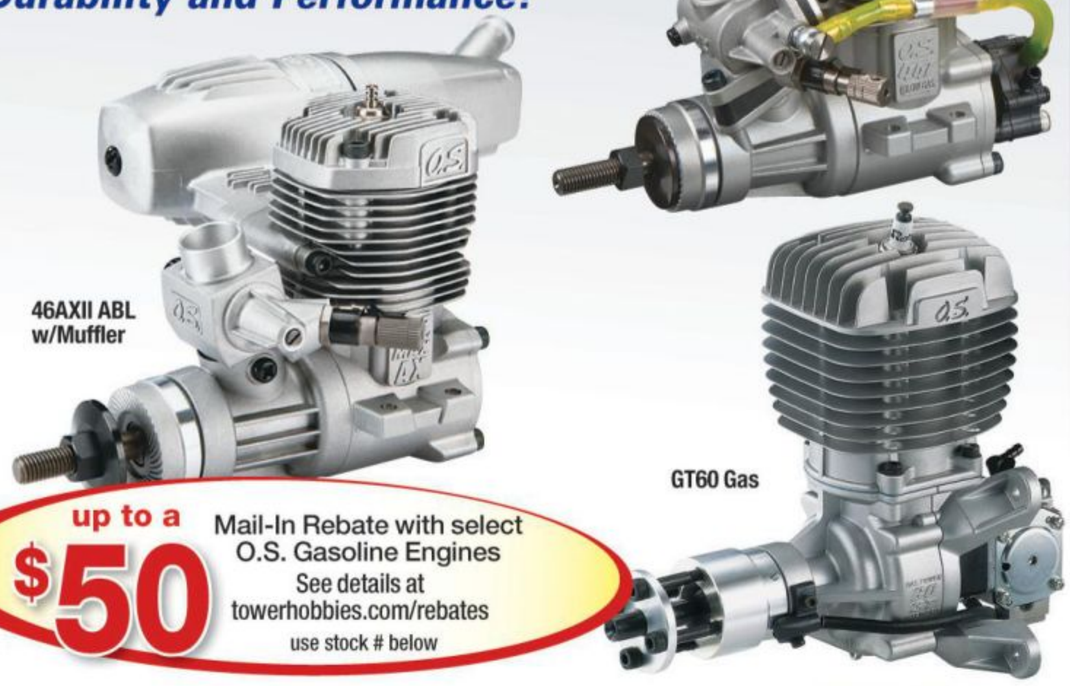
$20 Mail-In Rebate Certificate

w/Wired Radio Interface

ML1050	RealFlight 7.5 w/InterLink Elite Mode 2	$30 Rebate	3 PAY 56.66	$169.98
ML1051	RealFlight 7.5 w/Wireless SLT Interface	$20 Rebate	3 PAY 43.33	129.99
ML1052	RealFlight 7.5 w/Wired Interface	$20 Rebate	3 PAY 46.66	139.98
ML1053	RealFlight 7.5 w/Tactic TTX610	$30 Rebate	3 PAY 59.99	179.97
ML1054	RealFlight Drone w/InterLink Elite	NEW!	3 PAY 43.33	129.99
ML1055	RealFlight 7.5 Upgrade For G4 And Above		2 PAY 24.99	49.98

O.S.ENGINE

The First Choice for Quality, Durability and Performance!



up to a $50 Mail-In Rebate with select O.S. Gasoline Engines
See details at towerhobbies.com/rebates
use stock # below

ML1056	46AXII ABL w/Muffler		3 PAY 49.99	$149.97
ML1057	55AX ABL w/Muffler		3 PAY 56.66	169.98
ML1058	65AX ABL w/Muffler		3 PAY 69.99	209.97
ML1059	GGT10 10cc Gas/Glow Ignition	$25 Mail-In Rebate		319.99
ML1060	GGT15 Gas/Glow Ignition	$25 Mail-In Rebate	3 PAY 133.33	399.99
ML1061	GT33 Gasoline	$25 Mail-In Rebate	3 PAY 139.99	419.97
ML1062	GT60 Gas	$50 Mail-In Rebate	2 PAY 349.99	699.98
ML1063	GT60 Gas w/Muffler	$50 Mail-In Rebate		769.99
ML1064	GF30 4-Stroke Gas w/Muffler	$50 Mail-In Rebate	2 PAY 349.99	699.98
ML1065	GF40 4-Stroke Gas w/Muffler	$50 Mail-In Rebate		799.99

Enter stock numbers from this ad into the search box at towerhobbies.com for product specifications and requirements.

Futaba® Computer Systems

10CAG

14SGA

18SZA

NEW!

ML1066	7C 7-Channel FASST Air System	3 PAY 93.33	$279.99
ML1067	10CAG 10-Channel Integrated Air System		649.99
ML1068	14SGA 14-Channel Air Computer System	3 PAY 199.99	599.97
ML1069	14SGH 14-Channel Heli Computer System	3 PAY 199.99	599.97
ML1070	18SZA 18-Channel Air Telemetry System	NEW!	1099.99
ML1071	18SZH 18-Channel Heli Telemetry System	NEW!	1099.99
ML1072	18MZA 18-Channel Air Telemetry System		2999.99

6K

8JA

10JA

ML1073	4YF 4-Channel FHSS System	2 PAY 49.99	$99.98
ML1074	6K 6-Channel Air Telemetry System	NEW! 3 PAY 66.66	199.98
ML1075	6K 6-Channel Heli Telemetry System	NEW! 3 PAY 66.66	199.98
ML1076	8JA 8-Channel S-FHSS Air System	3 PAY 93.33	279.99
ML1077	10JA 10-Channel Air S-FHSS System	3 PAY 116.66	349.98

TACTIC™ PURE RELIABLE 2.4

Radios

SLT™ SECURE LINK TECHNOLOGY

TTX610

TTX850

$30 Mail-In Rebate with TTX850

See towerhobbies.com/rebates for details use stock # below

ML1078	TTX410 4-Channel SLT System	2 PAY 39.99	$79.98
ML1079	TTX610 6-Channel SLT System	2 PAY 49.99	99.98
ML1080	TTX850 8-Channel SLT Transmitter	$30 Mail-In Rebate 3 PAY 59.99	179.97

Futaba Receivers

R617FS

R7018SB

ML1081	R2006GS 6-Channel S-FHSS Receiver 6J		$34.99
ML1082	R2008SB S.Bus 8-Channel S-FHSS Receiver	2 PAY 24.99	49.98
ML1083	R617FS 7-Channel FASST Receiver	2 PAY 34.99	69.98
ML1084	R7008SB S.Bus2 FASSTest Receiver 14SG/18MZ	3 PAY 46.66	139.98
ML1085	R7018SB S.Bus/2 18Ch FASSTest Telemetry Receiver	3 PAY 83.33	249.99

Tower Hobbies® 424 4-Channel SLT Tx/Rx

SLT™ SECURE LINK TECHNOLOGY

GREAT gift!

There's no better choice than the value-packed 424!

6-Channel SLT Receiver

ML1086	424 4-Channel SLT System	2 PAY 24.99	$49.98
ML1087	6-Channel SLT Receiver		19.99

Flight Test

E-FLITE/HORIZON HOBBY
UMX FPV Radian

FIRST-PERSON-VIEW MADE EASY

BY **KLAUS RONGE** PHOTOS BY **PETER HALL**

EQUIPPING A FIXED-WING AIRPLANE with first-person-view (FPV) can seem daunting due to the complex equipment involved and the cost. The introduction of the E-flite UMX FPV Radian makes the FPV experience within reach of the average modeler in a Bind-N-Fly (BNF) package. The easy-to-fly UMX Radian includes the Spektrum VA1100 ultra micro airborne FPV system for a fantastic pilot's-eye view. The FPV system is compatible with any Fat Shark 5.8GHz FPV headset or video monitor. I used the Fat Shark Teleporter V4 Video Headset, which was developed exclusively for Horizon Hobby and has many features in an economic package.

SPECIFICATIONS

MODEL: UMX FPV Radian
MANUFACTURER: E-flite (e-fliterc.com)
DISTRIBUTOR: Horizon Hobby (horizonhobby.com)
TYPE: Micro motor glider
WINGSPAN: 28.7 in.
WING AREA: 83.4 sq. in.
LENGTH: 16.5 in.
WEIGHT: 1.75 oz.
WING LOADING: 3 oz./sq. ft.
RADIO REQ'D: 4-channel DSM2/DSMX compatible transmitter
PRICE: $190

GEAR USED

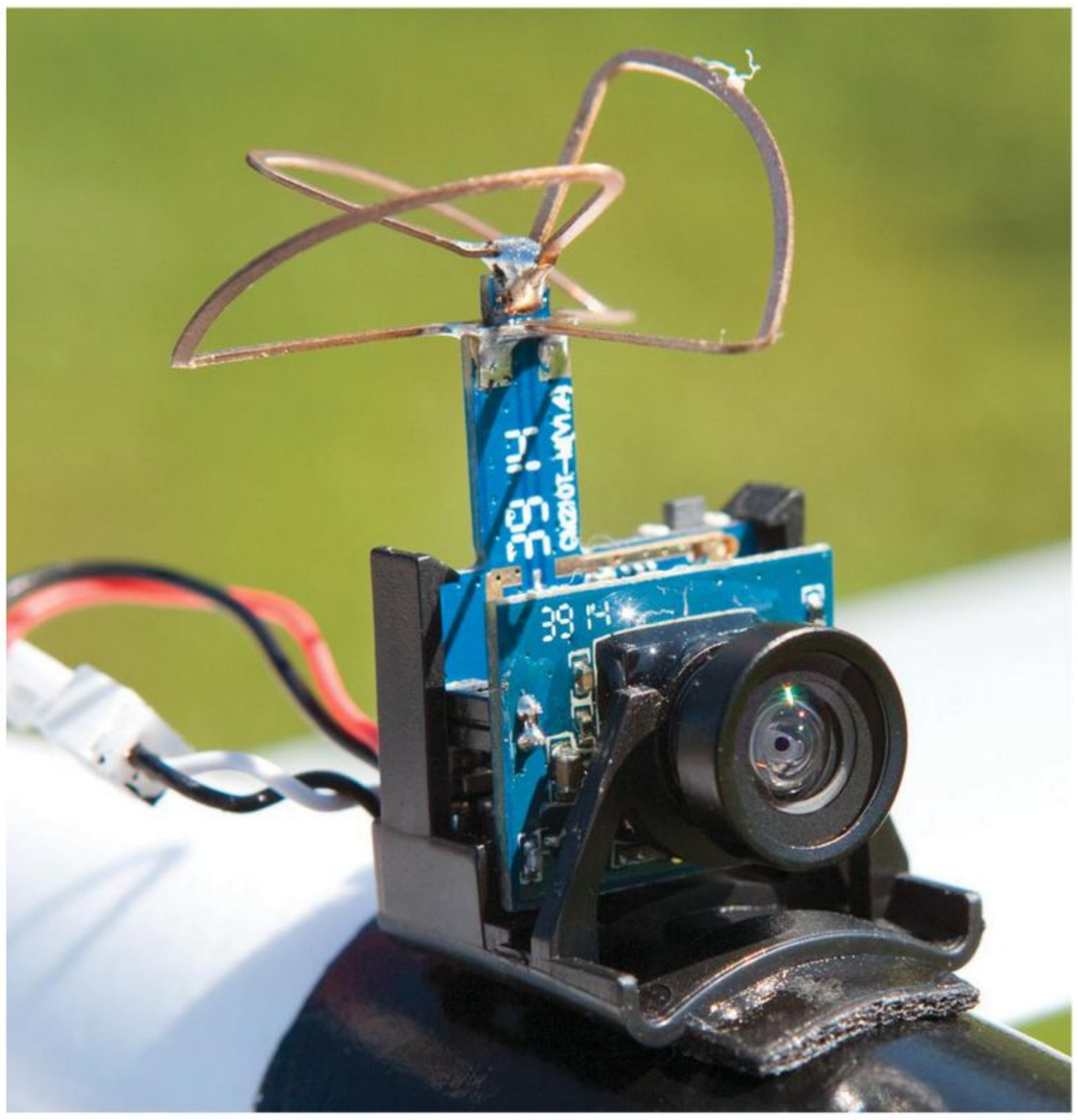
RADIO: Spektrum DX18QQ, 5-channel UM AS3X receiver/speed control, and 2.3g linear servos (installed) (spektrumrc.com)
MOTOR: Coreless brushed motor
BATTERY: E-flite 1S 150mAh 25C LiPo (included)
PROP: Clear folding propeller, 130x70mm

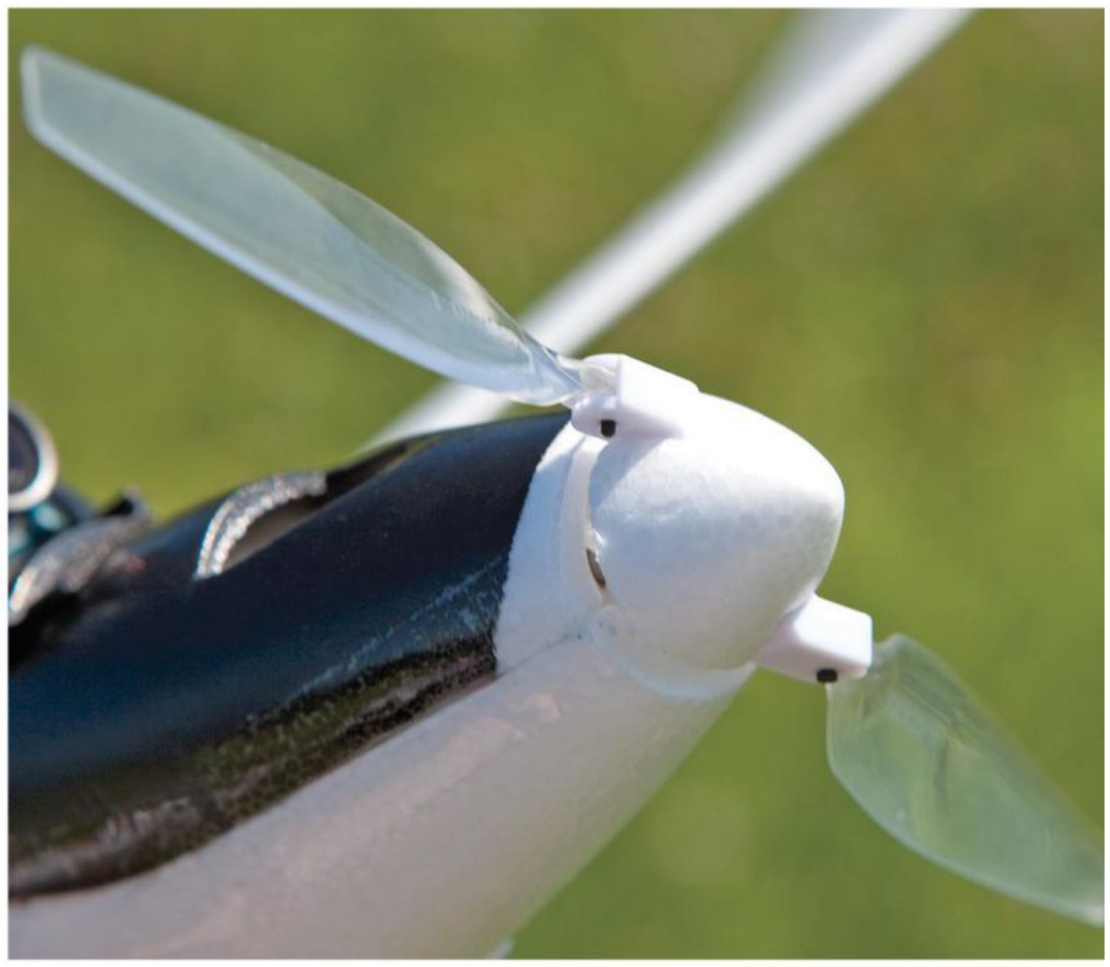
HIGHLIGHTS

- Spektrum FPV camera/transmitter included
- Compatible with Fat Shark 5.8GHz FPV headsets
- Smooth and stable flight characteristics
- Can be flown in small areas

The diminutive UMX Radian is a 3-channel powered glider that features Spektrum AS3X flight stabilization for smooth and stable flights. Included in the box is the fuselage with the motor and electronics installed, one-piece wing, LiPo flight battery, USB charger, FPV system, hardware package, and instruction manual. A 4-channel minimum, DSM/DSMX compatible transmitter is required to get the UMX Radian airborne. The Fat Shark Teleporter V4 Video Headset features a 5.8GHz wireless receiver, LCD displays, antenna, 760mAh LiPo battery with charge adapter, lens cloth, and carrying case.

The UMX Radian has gentle and relaxing flight characteristics and can be flown by anyone with a minimum of RC experience. These flight characteristics also make it ideal for the FPV experience, especially if you are new to this type of flying.





Above: The included VA1100 is a miniature camera and transmitter, which is easy to attach to the fuselage with double-sided tape. **Top right:** The folding, clear plastic propeller gives the pilot a great view through the FPV goggles without the typical video prop effect. **Bottom right:** Simple but effective: The control surfaces can be tweaked by adjusting the U shape in the pushrod.

UNIQUE FEATURES

Assembling the UMX FPV Radian literally takes only minutes. Slide the wing into the fuselage cutout, install and tighten the two wing screws, mount the FPV camera/transmitter with the included double-sided tape, and you are done. The one-piece carbon-reinforced molded foam wing is just as easily removed, and the plane can be safely stored and transported in the included packaging. The molded foam fuselage has the tail feathers factory installed and hinged with the pushrods connected. Carbon fiber is used to reinforce and stiffen the horizontal stabilizer and elevator, and there is a plastic skid on the bottom to protect the fuselage. Installed in the fuselage is a coreless brushed motor with gearbox, folding clear plastic propeller, and spinner. To control the UMX Radian, a Spektrum AS5430L DSMX 5-CH AS3X receiver is installed, which also incorporates the servos and speed control. The speed control has a brake programmed so that the folding prop will stop instantly and fold back for enhanced soaring. It will also start quickly to open the prop blades for climbing, extending the glide, or getting out of trouble. An attractive set of graphics is applied and includes stripes on the bottom of one wing panel to help with orientation. For easy maintenance, the fuselage halves are held together with clear tape, which can be removed to access the interior components and reassembled with a new piece of tape.

The setup of the UMX FPV Radian is quick and painless. After charging the included single-cell 150mAh 25C LiPo battery, the control surface centering and direction can be checked and adjusted. The pushrods have a U-shaped feature, which can be adjusted with a pair of needle-nose pliers to mechanically center the controls. I needed to tweak the elevator only slightly. I found the plane balanced at the recommended center of gravity with the flight battery toward the aft end of the battery compartment.

Because I am using the Fat Shark Teleporter headset, there is little in the way of preparation to get airborne. The camera/transmitter is powered by the flight battery through the installed Y-harness. To power up the headset, the included LiPo battery slips into the headband and is plugged into the power port. After powering up, I checked for a clear channel, of which there are seven to choose from. There is a small button on the camera/transmitter to change its frequency to match that of the headset.

IN THE AIR

To get a feel for the UMX Radian's flight characteristics, I initially flew the plane sans the FPV. Ideally the wind should be calm, but the Radian can handle winds of 10mph without difficulty, thanks to the AS3X system. A gentle toss at about half throttle is all that is needed to get the plane into the air. Because I have limited

10th Anniversary

eFest 2016™

Hosted By Hobbico

Indoor Electric R/C Fest

New Multi-Rotor Attractions and Workshops!

Feb 6-7

CHAMPAIGN, IL

University of Illinois Armory

hobbico-efest.com

3D Airplanes **Scale & Micro Flyers** **Multi-Rotors**

Open Flying · Exhibitors · Seminars · Prizes · Freestyle · "Gauntlet" · Combat · Night Flying

FPV experience with an airplane, I had a spotter next to me in case I became disoriented when it came time to try the FPV system. I found the Radian to be just as easy to fly using the FPV system as without and quickly got the hang of it. When I got confused, I let go of the controls and eventually figured out where I was. The plane can be flown in very small spaces, such as a local park, a large backyard, or even in a large indoor space. Landings are easy; just let the plane glide in and gently flare before touchdown. The clear plastic prop is a neat feature and eliminates the annoying prop effect seen on most video displays.

GENERAL FLIGHT PERFORMANCE

Stability: Like the larger Radian, the long curved wing gives exceptional stability.

Tracking: Even though the plane has only 3 channels, it tracks well and is aided by the AS3X system.

Aerobatics: Soaring is the Radian's forte, and it is not designed to be highly aerobatic, although it is quite responsive. An occasional loop, however, is fun to do.

Glide and stall performance: Being a glider, the UMX Radian naturally excels in the glide. With only a few knots of wind, the plane can be held motionless in front of you. If flown aggressively, the plane will tip-stall but recovers quickly. The key to flying the UMX Radian is smooth control inputs to increase glide performance.

THE UMX FPV RADIAN AND FAT SHARK TELEPORTER HEADSET GIVE THE PILOT A SENSE OF FLYING A FULL-SCALE AIRPLANE.

PILOT DEBRIEFING

I recommend getting several additional flight batteries as they are inexpensive and the flight time is relatively short when using the FPV system. I was getting about eight to 10 minutes with the FPV system disconnected and about five minutes with it operational, depending on how much the motor is used. After some experience in finding thermals, the flight times should increase substantially. If you are looking for a hassle-free, low-stress, and relaxing plane to get into the FPV scene, the UMX FPV Radian and Fat Shark Teleporter headset combination can't be beat.

Available separately, the Fat Shark goggles are a perfect match for the UMX FPV Radian.

BOTTOM LINE

Most RC pilots are probably curious as to what it would look like to be in the cockpit of their plane while it is flying. The UMX FPV Radian and Fat Shark Teleporter headset give the pilot a sense of flying a full-scale airplane in a BNF package that is ready to fly by the time the batteries are charged. Despite weighing less than two ounces, the AS3X-equipped Radian makes a great FPV platform and handles like its big brother, the Radian.

First-Person-View Headset

Fat Shark, the company synonymous with FPV systems, has developed the Teleporter headset exclusively for Horizon Hobby, and it is compatible with Spektrum and Fat Shark 5.8GHz cameras. It features digital head tracking, which, when activated, will zoom in on the image and tilt and pan in relation to your head movement. This gives the effect of head tracking with a fixed camera. Analog head tracking is also available for gimbal-mounted cameras. It costs $290.

PROTECT YOUR RC INVESTMENT!

You take enough risks in the air. Get organized and keep your gear safe during storage and transport.

WING TOTES

With foam and fleece dividers to separate & protect wings. Three sizes of each to choose from. Starting at $59.99

RADIO TOTE

With die cut foam for your radio, batteries, charger & more. $49.99

FIELD TOTE

Carry all yourfield-related items in a single bag. Made with durable nylon, closed cell foam padding, waterproof lining and heavy zippers. $49.99

HELI TOTES

Several sizes to choose from, from Blade CX class to 450-size helicopters. Starting at $64.99

PROP & ROTOR BLADE COVERS

Inexpensive protection against scratches and dings for your propellors and rotor blades. Cheaper than replacement blades and will save your car's interior. Starting at $9.99

Available at the finest shops nationwide

WING TOTE®
performance. engineered. protection.

wingtote.com

Go to AirAgeStore.com and **get 40% off your entire purchase from December 8, 2015 through January 8, 2016.**
Enter promo code Festive40 at checkout.

New Product!

GETTING STARTED IN RC AIRPLANES

Item# 2047 $27.95

Written by our senior tech editor, Gerry Yarrish, this newly updated book has helped thousands of RC pilots earn their wings for more than a decade. You will get:

- The latest radio technology
- The lowdown on electric and glow power systems
- Setup tips for ARFs

This revised edition includes all the tips and tricks you'll need to know to get in the air. Get ready to have some fun!

Bestseller

MODEL AIRPLANE NEWS BUYERS GUIDE APRIL ISSUE 2015

Item# M1504 $6.99

Get our annual roundup of all the gear you need to build, tune, and get in the air with your favorite plane, or to help you pick out your next favorite! This special section features more than 200 of the best planes, helis, multirotors, radios, motors, electronics, tools, and more. No matter the type or the scale of the aircraft that you fly, the 2015 Buyer's Guide has what you need—it is the ultimate resource for RC aviation!

Premium Site

BIG savings!

MODEL Airplane NEWS

Includes:

- **Big savings! Get an automatic 5% off all purchases at AirAgeStore.com**
- Subscription to *Model Airplane News* digital edition
- 27 years of *Model Airplane News* archives
- Digital versions of all *Model Airplane News* special issues

Item# MANMEMBERSHIP

MAIL ORDERS—PLEASE INCLUDE POSTAGE AND HANDLING CHARGES WITH ALL ORDERS: U.S. — $3.99 first item, $1.50 each additional item, per shipping address. Canada — $9.99 first item, $2.99 each additional item, per shipping address. International — $14 first item, $4.50 each additional item, per shipping address. Residents of CT, add 6% state sales tax. Residents of KY, add 6% sales tax. Additional county taxes will also apply. Canada, add GST. All checks and money orders must be in U.S. dollars drawn on a U.S. bank.

Download order form online.

DVDs for Instant Aerobatics Success!

HELICOPTER AEROBATICS MADE EASY

Item# DVD24 $27.95

- World helicopter champion Jamie Robertson teaches you how to perform 16 aerobatic maneuvers
- Learn fast with detailed step-by-step instructions
- Insider heli setup secrets

AEROBATICS MADE EASY

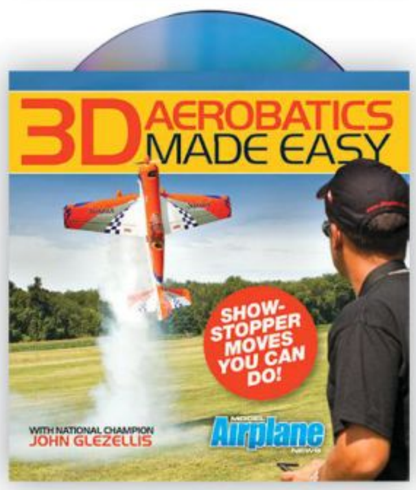
Item# DVD20 $27.95

- National champion John Glezellis demonstrates a range of maneuvers
- Detailed step-by-step instructions
- Pro setup tips and piloting secrets
- Everything you need to know to become a hotshot aerobatic pilot!

ADVANCED AEROBATICS MADE EASY

Item# DVD21 $24.95

- National aerobatic champion John Glezellis demonstrates competition- level 3D moves
- In-flight footage included
- Pro setup tips, flight instructions, and 3D secrets
- You will be the local hotshot pilot after watching this



3D AEROBATICS MADE EASY

Item# DVD22 $24.95

- Take your flying to the next level
- National RC aerobatic champion John Glezellis teaches you complex 3D moves
- Detailed step-by- step instructions

FREESTYLE AEROBATICS MADE EASY

Item# DVD23 $27.95

Expert RC pilot and national champion John Glezellis uses an electric Carbon-Z to demonstrate a variety of maneuvers

- Instructions on how to set up your electric plane for maximized 3D performance
- Highest level of electric aerobatics

CONSTRUCTION

BY **PAT TRITLE**

Although the Storch is lightweight, it is not a floater. It has excellent flight performance and can operate from small rugged areas, just as the full-size plane did.

Fieseler Fi 156 Storch

World War II German Recon Bird

Used throughout World War II, the Fieseler Fi 156 Storch was a two-place observation airplane with a 46-foot 9-inch wingspan and a gross weight of 2,780 pounds. It was powered by a 240hp Argus As 10 V8 engine and had a range of 240 miles. The Storch would climb at 945 feet per minute and had a service sealing of 15,090 feet.

The 55-inch-span model uses conventional wood construction and is 37.5 inches long. The model requires a 5-channel radio and has functional flaps. It features plug-in wings and has a fuselage hatch. No tools are required for assembly or battery access. With its large flaps and a flying weight of only 21 ounces, the Storch's slow flight speed and short-field performance are exceptional.

BUILDING THE MODEL

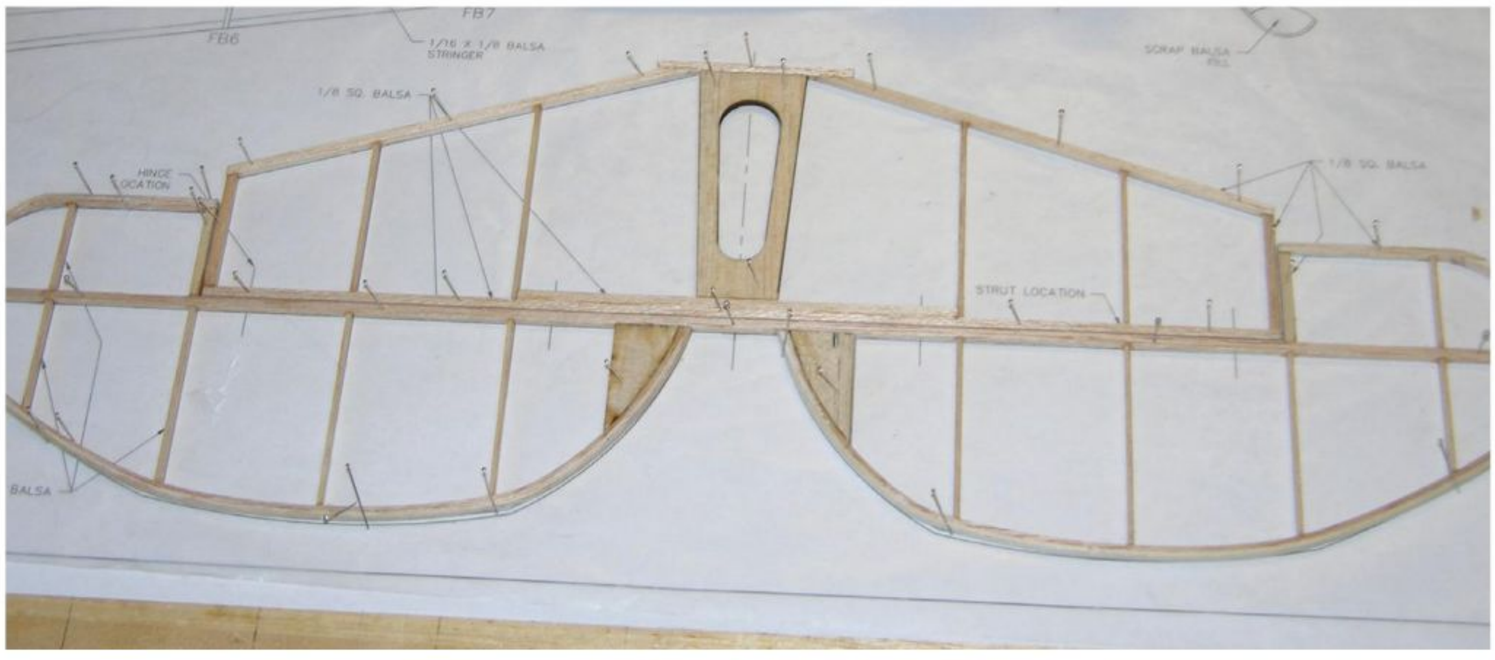
Begin by studying the plans. The Storch is a fairly complex build, and a lot of detail is provided. Familiarizing yourself with the assembly techniques will save a lot of time once construction begins. Patterns are provided for all of the parts, and the patterns can be used to make print wood sheets. Cut all of the parts required for each assembly as needed. The majority of the build is done directly over the plans using Zap CA glue for general framing and Pacer Formula '560' Canopy Glue to attach the paper and plastic parts.

TAIL SECTION

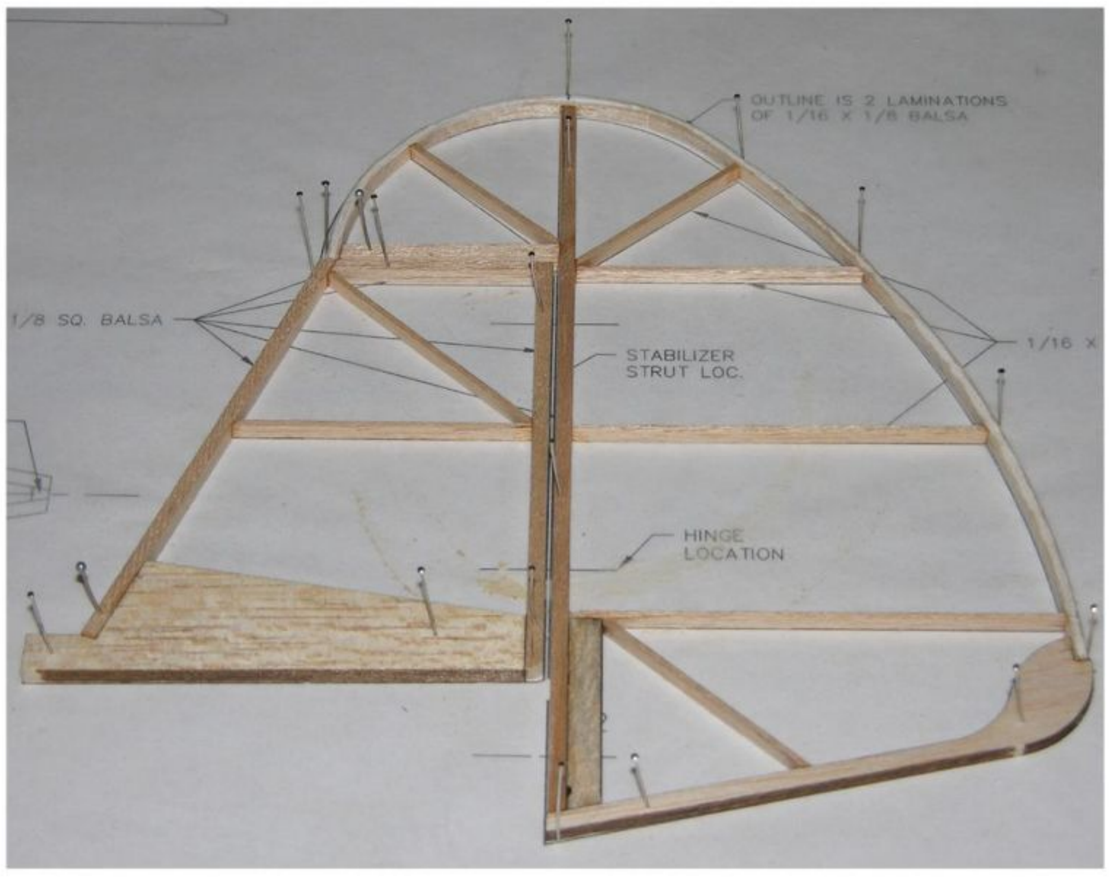
Begin by laminating (bowing) the rudder and elevator outlines. A step-by-step tutorial is available at patscustom-models.com/bowedoutlinres.html. Assemble the vertical and horizontal stabilizers directly over the plans. Remove the frames from the board, and sand to shape. Cut the hinge slots, make up the hinges, and dry-fit them in place.

WINGS

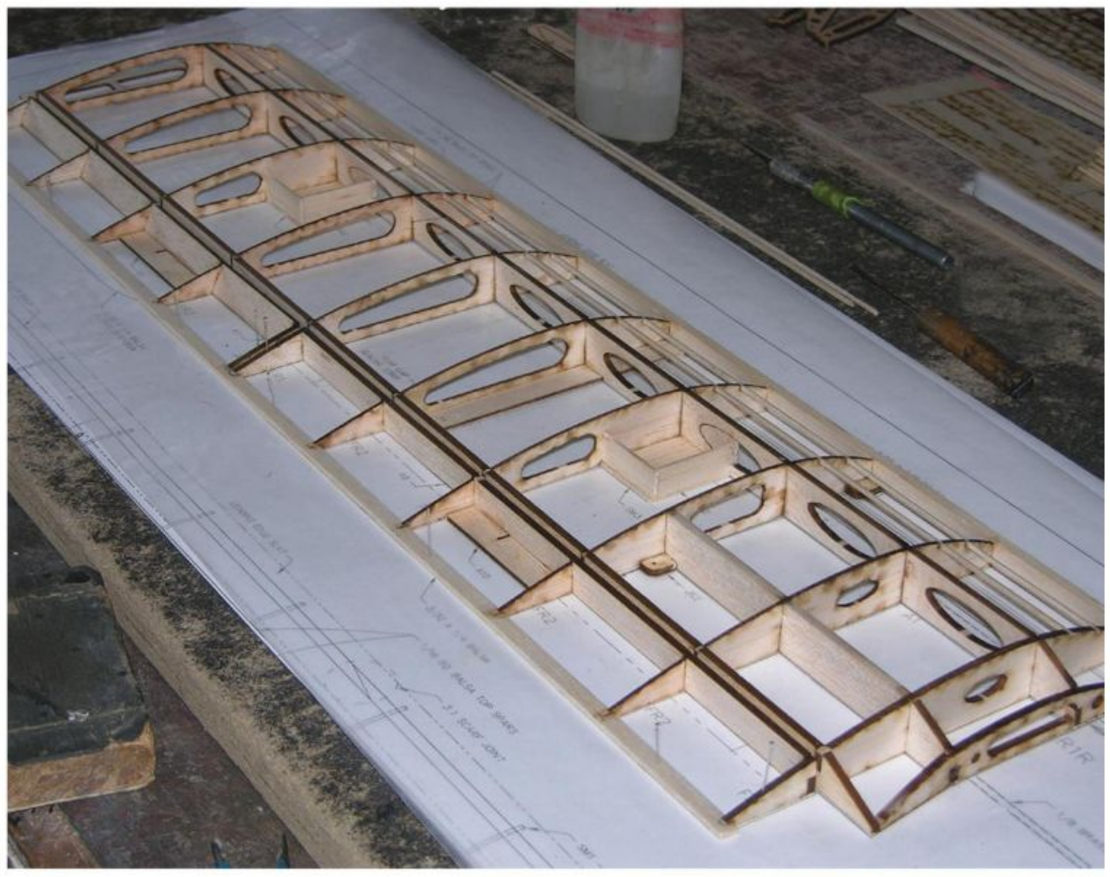
Assemble the wing panels directly over the plans, and build the flaps and ailerons in place during wing construction. When complete, lift the parts from the board, and sand to shape. Cut all the hinge slots, and dry-fit the parts in place. Center the servo arms, and glue the flap and aileron servos onto the mount plates using silicone caulk. Run the servo leads through the wings, with a few inches protruding from the root rib. Cut and fit the aluminum strut fittings onto A4, and secure with a wrap of sewing thread and



The horizontal stabilizer is built directly over the plans. To keep the tail light and strong, a bowed outline is used.



The vertical stabilizer is built directly over the plans. To keep the tail light and strong, a bowed outline is used.



The finished wing panel will be removed from the board and sanded to final shape.

a thin line of Zap glue. Glue the brass joiner tubes in place.

FUSELAGE

Build the left and right fuselage frames over the plans. The upper cabin frame will not be glued in place until after the frames have been joined. Lift the frames from the board, and sand them flush on both sides. To join the frames, begin by cutting four 1/8-inch-square balsa "A" crosspieces. Pin the frames over the framing plan, align the frames vertically, and glue the crosspieces in place. Lift the frame from the board, and glue all of the formers in place from FB5 forward, except the landing-gear mount assembly.

Pull the aft section together, and glue FT4 and the bottom crosspiece in place. Build and glue in place the tailskid mount assembly and B1, then pull the tailposts together. Add formers FT1 through FT3 and FB6 through FB8, followed by the top and bottom stringers from FB4 aft. To assemble the upper cabin, sand bevels into the frames using the cross-sectional drawings for reference. Pin the formers in place on the drawing and glue the frames to it, then glue the upper cabin assembly in place. Assemble the landing-gear

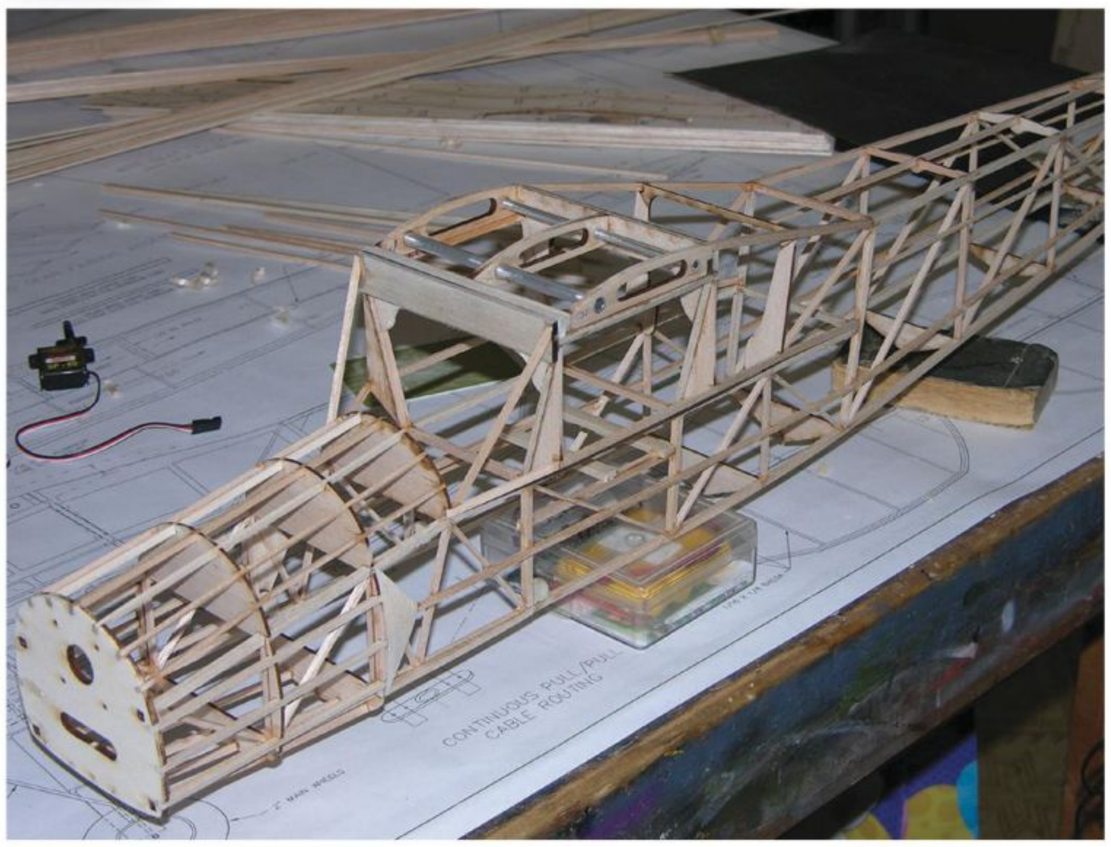
SPECIFICATIONS

Model: Fieseler Fi 156 Storch
Type: 1/10-scale WW II observation aircraft
Wingspan: 55 in.
Wing area: 392 sq. in.
Weight: 21 oz.
Wing loading: 7.3 oz./sq. ft.
Length: 37.5 in.

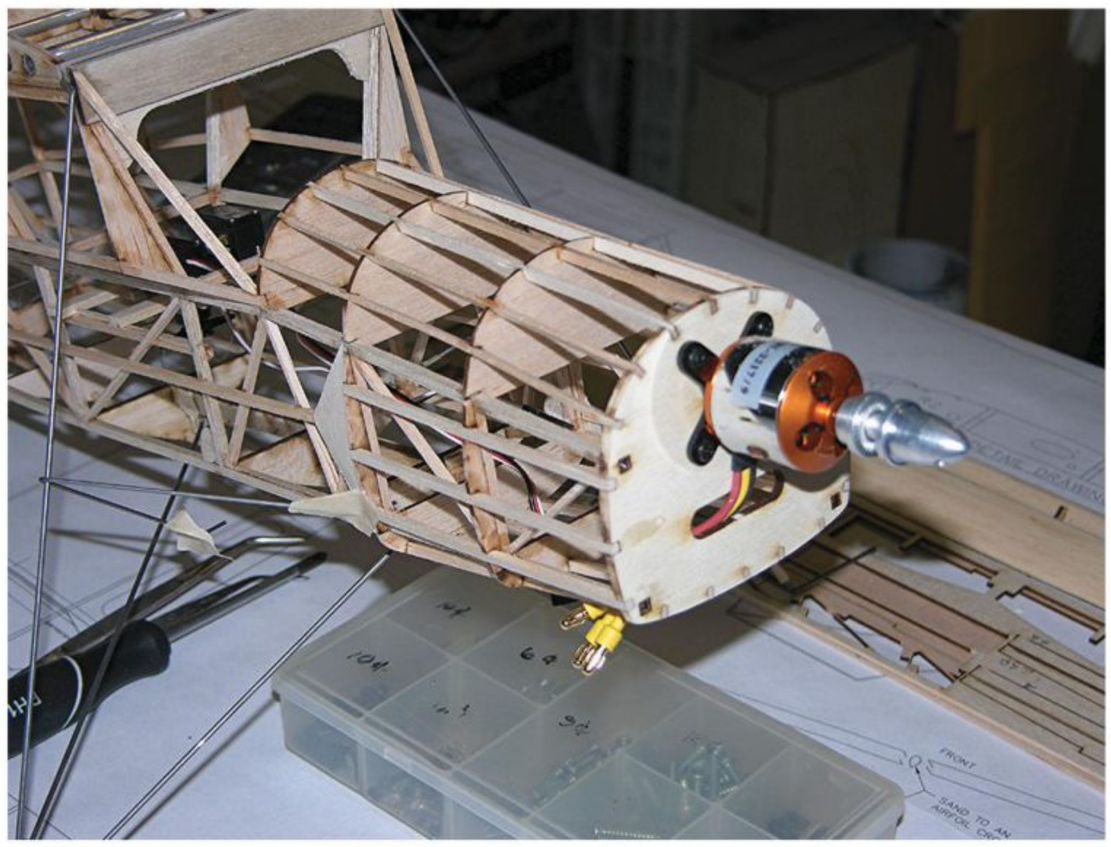
GEAR USED

Radio: Spektrum DX7 w/ AR6000 receiver (spektrumrc.com)
Servos: Four 6g submicro servos (flaps and ailerons); two 8g submicro servos (elevator and rudder)
Motor: Suppo 2217/9T outrunner w/ 20A speed control (suppomodel.com)
Propeller: APC 11x5.5E (apcprop.com)
Battery: Sky Lipo 1300 2S LiPo (hobbypartz.com)

All ready for the Storch's maiden flight.



With the cabin assembly complete, the wing center section is dry-fitted into the frame. It won't be glued in until final assembly. The windshield frame will be added after the fuselage is covered.



The Suppo 2217 outrunner is mounted on the firewall using sheet-metal screws. The right thrust is set up using flat washers under the left side of the mount.

mount, and glue it in place. The remaining formers can be added, followed by the cowl stringers forward of 3B, then build the wing center section over the plans.

Set up the rudder and elevator servos, and install the elevator pushrod guide tube. Install the rudder cables, and mark the exact location where they exit the fuselage. Install the motor, and test-run to ensure proper rotation. Build the cowl using laminated layers, or carve it from a block and hollow it out.

LANDING GEAR

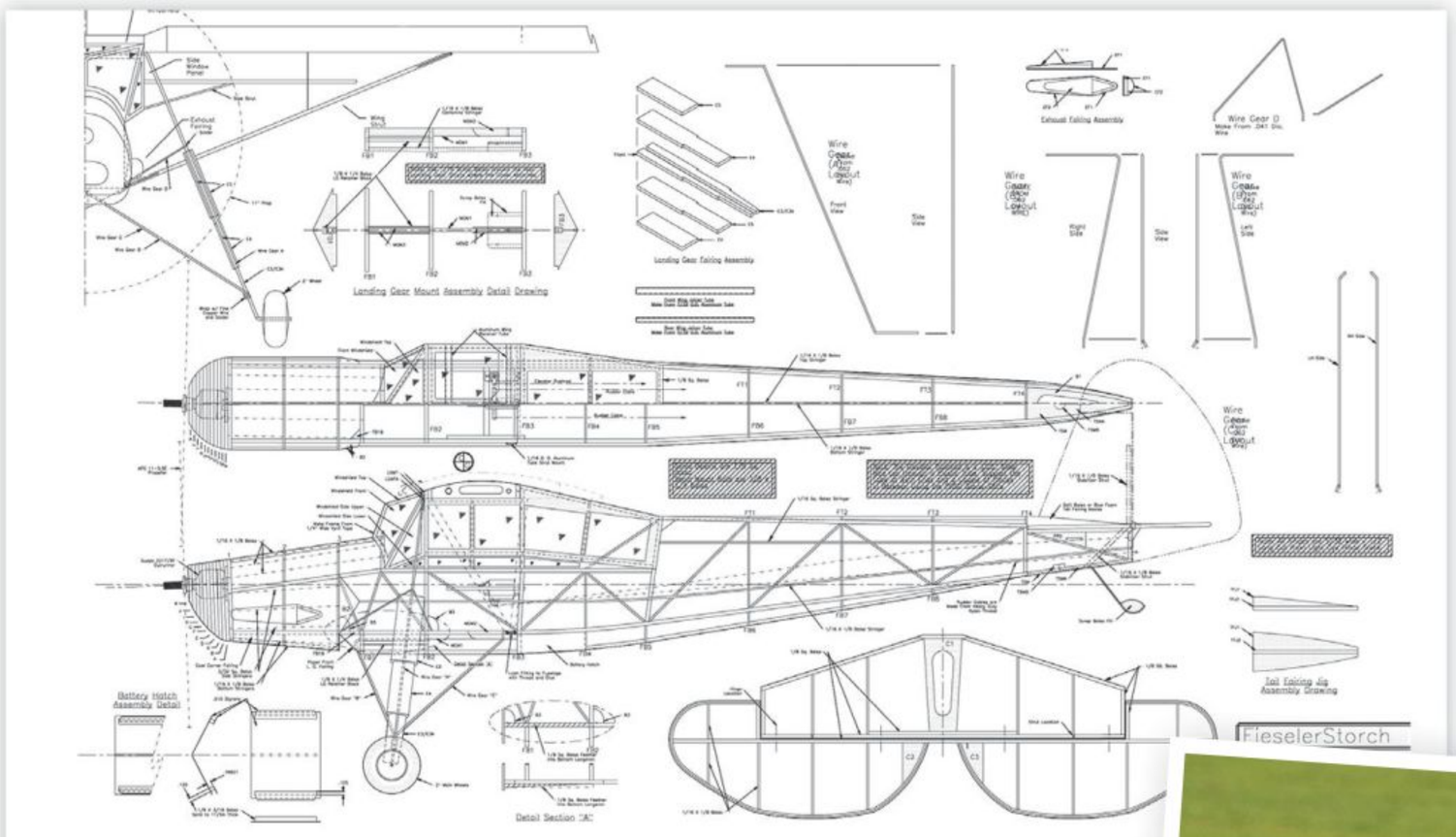
Build the landing-gear mount assembly. Bend the B struts using the provided patterns, then slip the struts into the mount and glue the assembly in place. Bend the remaining struts, and fit them into the fuselage. Tweak the struts as needed for a good fit. The landing gear won't be permanently assembled until after the fuselage is covered.

FINAL DETAILS

Do a final sanding, then fully assemble the model to correct any problems that might crop up. Fix them now while things are still accessible. Build the jig for the tail fairing block, and sand the blocks to shape. Build the lift and jury struts, and fit them to the model to produce one degree of wingtip washout. Build the battery hatch, and fit in place. Make all of the cabin window frames and the cowl fairings out of file-folder paper, and glue in place.

COVERING

The model can be covered with tissue or light silkspan and dope, or any lightweight iron-on film, such as Microlite. Do not use MonoKote or UltraCote due to the excessive weight and shrink rate. If painting is required, look in on my tutorial at patscustom-models.com/paintinglitefilm.html.



Fieseler Fi 156 Storch | XO216A

Designed by Pat Tritle, this classic WW II observation and STOL aircraft is a great performer. It has lightweight balsa "stick and former" construction, and laser-cut parts are available from the author. It has function flaps and scale construction and outline.

Span: 55 in.; Length: 37.5 in.; Radio: 5-channel; Power: 2217/9T outrunner; LD: 2; 3 sheets; $27.95

To order the full-size plan, visit AirAgeStore.com.

FINAL ASSEMBLY

The fuselage is narrow and access is a bit tricky, so think ahead as you proceed. Install the rudder cables and the elevator pushrod. Install the flap and aileron Y-harness lead, bring the connectors out through the center section, and glue it in place. Assemble the landing gear, wrap and solder the joints, then install the main wheels. An alternate mounting method is shown at patscustom-models.com/wheelretainer.

Now, glue the tailskid in place.

Glue all of the hinges in place, then glue the tail section in place and add the fairing blocks. The flap and aileron pushrods are 0.032-inch steel wire with a Z-bend at each end. Glue the control horns in place, and adjust the control throws as shown. Connect the elevator pushrod using a Z-bend at the hinge line, then glue the control horn in place. Connect the rudder cables, and add a drop of Formula '560' Canopy Glue on the servo arm to prevent slippage.

Glue the cabin windows and flap-gap fairings in place. Add any desired details to finish up the model. Build up the leading-edge slats, and glue them in place on the wings. Balance the model as shown on the plans using the position of the battery to fine-tune the center of gravity. Build the battery tray out of light ply, and glue it in place. Secure the battery with hook-and-loop fasteners.

FLYING THE STORCH

The Storch is not a floater but, rather, a good solid flier that's very light on the controls. Using the 2217 outrunner motor with a 2S pack, the model exhibits scalelike flying qualities. Ground handling is excellent, and with the flaps deployed, it just won't stay on the ground for long.

The climb rate is substantial, so you'll need a little down-elevator to keep it in check. For full-flap takeoffs, down-elevator is required to prevent the model from stalling. With full flaps, the model will fly so slowly that the ailerons will become ineffective, so stay on the rudder. The flaps also create a fair amount of drag, so use power to keep the sink rate in check.

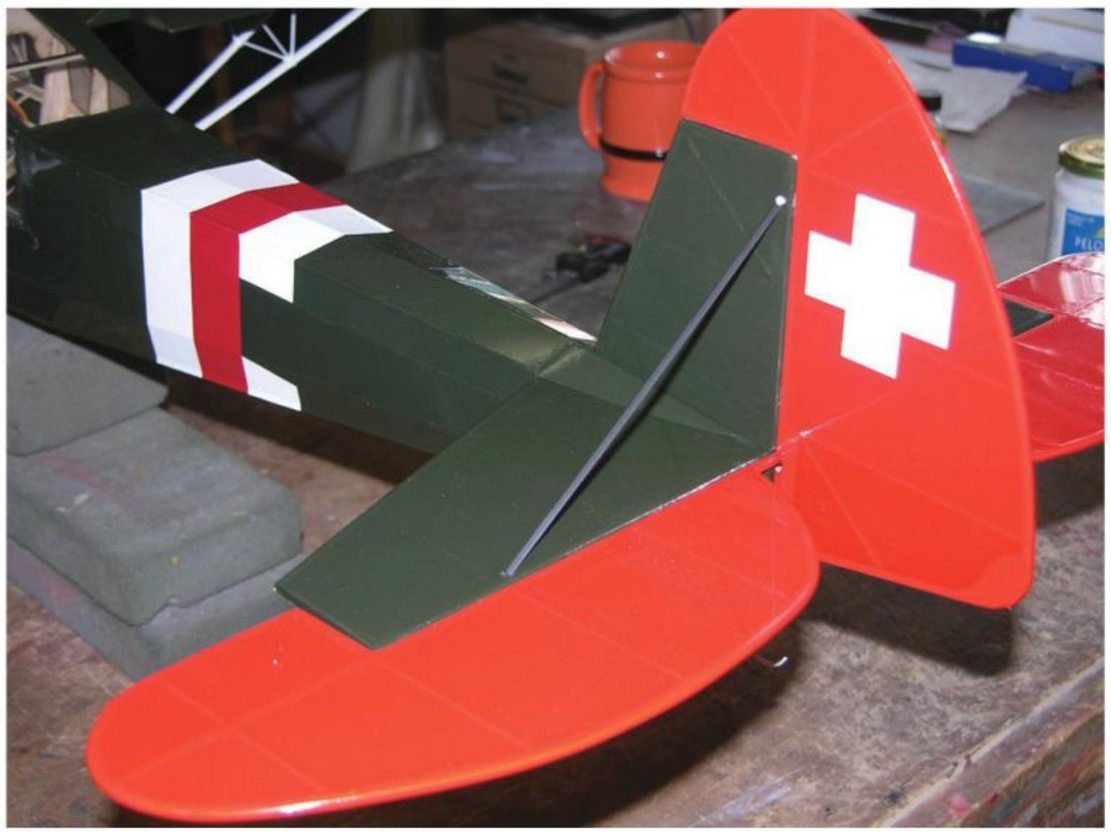
After you get the feel of the Storch, try some short field takeoffs and landings. For full-flap touch-and-gos: When the main wheels touch, go to the takeoff position and the model will stick to the ground without a bounce, then power up and go again.

Photo by John Dibbs/planepicture.com

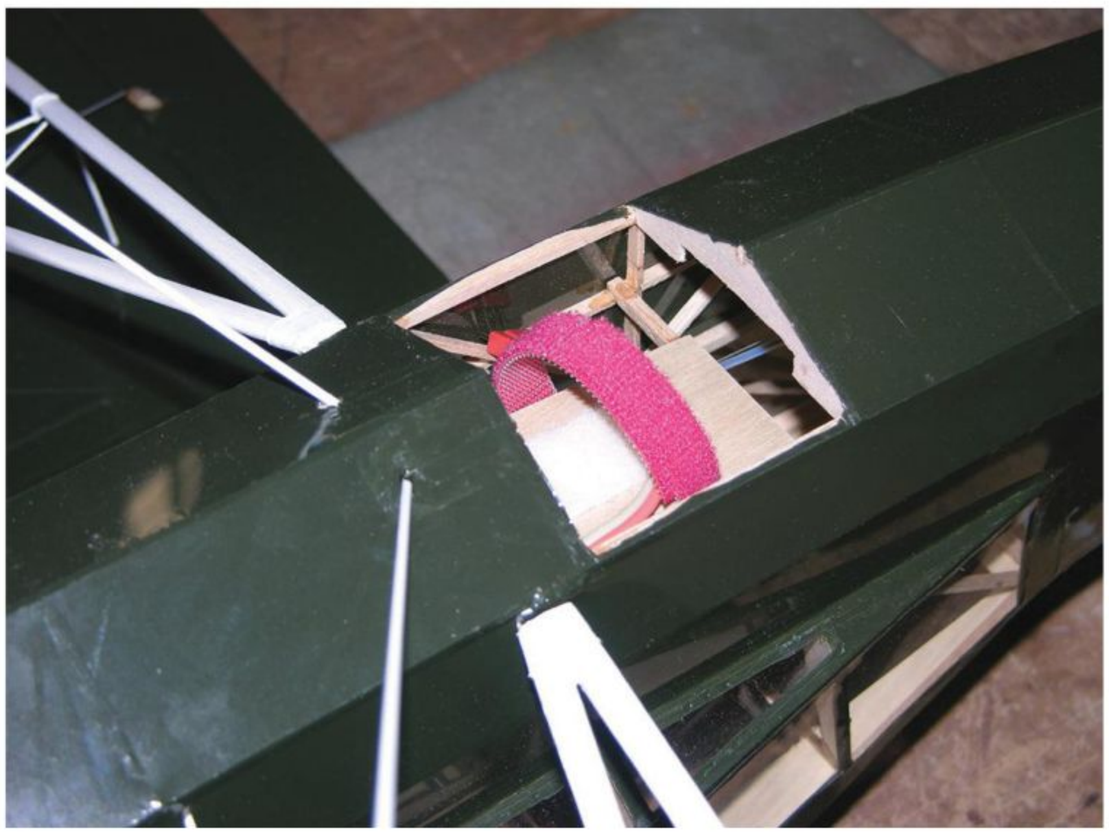
The Fieseler Fi 156 Storch

An observation aircraft built by Fieseler prior to and during World War II, the Storch was produced for the civilian market after the war in Germany, the Soviet Union, France, and Czechoslovakia, and it remains famous to this day for its excellent STOL (short takeoff and landing) performance. Conceived by Reinhold Mewes and Erich Bachem, Fieseler's design had a fixed slat the full length of the wings' leading edges, while hinged and slotted flaps and ailerons ran along the trailing edges.

The Storch had folding wings, allowing it to be towed to required locations and stored in much smaller areas then conventional aircraft. Its rough-field takeoff and landing capability using an Oleo strut arrangement allowed it to operate from almost anywhere. With a stall speed of just 32mph, the airplane was capable of very short landings, including vertical or even backward landings in high winds.



The stabilizer struts are sanded to an airfoil shape and glued in place on the vertical and horizontal stabilizers.



The battery is secured to the tray with hook-and-loop fasteners and a strap to prevent the battery from falling out. Also note the balsa plates under the cover at the rear center landing-gear struts.

STATEMENT OF OWNERSHIP

Statement of Ownership, Management, and Circulation (Required by 39 U.S.C. 3685). 1. Title of Publication: MODEL AIRPLANE NEWS. 2. Publication no.: 533-470. 3. Date of Filing: November 1, 2015. 4. Frequency of Issue: Monthly. 5. Number of Issues Published Annually: 12. 6. Annual Subscription Price: $38. 7.Complete Mailing Address of Known Office of Publication: 88 Danbury Rd., Wilton, CT 06897-4423. 8. Complete Mailing Address of Headquarters or General Business Office of Publisher: Same. 9. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor: Publisher: Louis V. DeFrancesco, 88 Danbury Rd, Wilton, CT 06897-4423. Editor: Debra Cleghorn, 88 Danbury Rd, Wilton, CT 06897-4423. Managing Editor: None. 10. Owners: Louis V. DeFrancesco and Yvonne M. DeFrancesco, 88 Danbury Rd, Wilton, CT 06897-4423. 11. Known Bondholders, Mortgages, and Other Security Holders Owning or Holding 1 Percent or more of Total Amount of Bonds, Mortgages or Other Securities: None. 12. Does not apply. 13. Publication Name: MODEL AIRPLANE NEWS. 14. Issue Date for Circulation Data Below: November 2015. 15. Extent and Nature of Circulation: Average Number of Copies Each Issue During Preceding 12 Months: A. Total Number of Copies (Net Press Run): 81,936. B. Paid and/or Requested Circulation. (1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541: 45,025 (2) 0 (3) Sales through dealers and carriers, street vendors and counter Sales: 17,164 (4) 0. C. Total Paid and/or Requested Circulation: 62,189. D. Free Distribution by Mail, Samples, Complimentary and Other Free: (1) 3,407 (2) 0 (3) 0. (4) Free Distribution outside the Mail: 4,049. E. Total Free Distribution: 7,456. F. Total Distribution: 69,646. G. Copies Not Distributed 12,290. H. Total: 81,936. I. Percent Paid and/or Requested Circulation: 89.3%. 16. Electronic Copy Circulation: A. Paid Electronic Copies: 18,576. B. Total Paid Print Copies + Paid Electronic Copies: 80,765. C. Total Requested Copy Distribution + Paid Electronic Copies: 99,342. D. Percent Paid (Both Print & Electronic Copies): 81.3% Actual Number of Copies of Single Issue Published Nearest to Filing Date. A. Total Number of Copies (Net Press Run): 80,720. B. Paid Circulation. (1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541: 44,357 (2) 0 (3) Sales through dealers and carriers, street vendors and counter Sales: 16,910 (4) 0. C. Total Paid Distribution: 61,266. D. Free or Nominal Rate Distribution by Mail, Samples, Complimentary and Other Free: (1) 3,357 (2) 0 (3) 0. (4) Free or Nominal Rate Distribution Outside the Mail: 3,989 E. Total Free or Nominal Rate Distribution: 7,346. F. Total Distribution: 68,612. G. Copies Not Distributed 12,108. H. Total: 80,720. I. Percent Paid: 89.3%. 16. Electronic Copy Circulation: A. Paid Electronic Copies: 19,030 B. Total Paid Print Copies + Paid Electronic Copies: 80,297. C. Total Requested Copy Distribution + Paid Electronic Copies: 99,327. D. Percent Paid (Both Print & Electronic Copies): 80.8% This statement of ownership will be printed in the February 2016 issue of this publication. I certify that the statements made by me above are correct and complete. Yvonne DeFrancesco, Publisher.

GET IN ON THE ACTION!

RCX

RADIO CONTROL AND ACTION TECHNOLOGY EXPO

MARCH 12-13, 2016

SATURDAY 10AM - 5PM / SUNDAY 10AM - 4PM

OC FAIR & EVENT CENTER
COSTA MESA, CA

OC Fair & Event Center

GET TICKETS TODAY! RCX.COM

or call 317-236-6515

The Most Dynamic Event in the World of RC and Action Technology!

Try Me Tracks • Indoor & Outdoor Fly/Race Zones • Giveaways • Great Family Value • See Industry Pros • Buy The Hottest Products At Show Specials

HORIZON HOBBY · TRAXXAS · TOTAL CONTROL INNOVATIONS · RADIO CONTROL car action · MODEL Airplane NEWS · Rotor Drone MAGAZINE · electric flight · Die Cast X · Flight Journal

Product Watch

MINI-REVIEWS OF EDITORS' FAVORITES

Jolly Logic AltimeterThree

This new gadget is an interesting tool for RC enthusiasts. This airborne unit is just 2 x 0.6 x 0.7 inches, so it is small enough to fit even in very small fuselages, and it weighs a scant 0.36 ounces. You need to download the pertinent software on your smartphone and then connect it with the airborne unit. It connects via Bluetooth with smartphones or tablets, and it records data from your flight. Before you fly, you must select your mode from the following options: airplane, glider, quadcopter, helicopter, rocket, raptor, kite, and experimental.

Once you land, all data is transferred to your Flight Review screen. Accelerometers in the unit provide data from takeoff time to landing. It will also give your maximum altitude during the flight, and if you have GPS on your phone, it can show your takeoff location on a map. If you want to share this data with friends, that can easily be accomplished from the software with many possible options.

I flew it with a few planes and an F5J Xplorer2 4000 glider, and this provided the most interesting data. Each time, the vertical profile gave me lots of information to consider and evaluate my flight, including both the start height and maximum height.

For a last flight, I decided to fly my CAP 580 as low as I could possibly do shooting touch-and-gos. I did 12 of these in 6:13 minutes at a maximum altitude of 68 feet. The chart looked like a cardiogram!

With all that said and a price tag of about $100, I give the AltimeterThree five out of five stars. *—Aris Kosmides*

jollylogic.com

Mercury Adhesives Medium-Strength Threadlocker

While operating any flying model or vehicle, one thing is sure to happen: After an undetermined length of time, something with threads is going to come loose. This could be a setscrew holding landing-gear parts in place or an important part of your power system. Either way, a loose attachment fixture leads to vibration. And vibration leads to more loose screws. The best way to prevent this cascade of unfortunate situations is to use thread-lock. As the name implies, it locks the threaded parts in place.

The new Medium-Strength Threadlocker from Mercury Adhesives is ideal for all types of threaded fasteners with metal-to-metal contact. You should not use any thread-lock compound on screws that thread into plastic. When it comes to using thread-lock, less is always better than more. The new Mercury Adhesives' bottle comes with a brush in the cap for a no-mess application. Just unscrew the cap, pull out the brush, wipe off the excess Blue threadlocker on the side of the opening, and apply only enough to do the job. The Blue formula makes the threaded parts secure, but should you want to remove the screws all you need is a screwdriver or an Allen wrench—no heating is required. Avoid having a screw loose, and use this new medium-strength Threadlocker from Mercury Adhesives, priced at $7.49 for a 0.176-ounce bottle. *—Gerry Yarrish*

mercuryadhesives.com

HARBOR FREIGHT

QUALITY TOOLS AT RIDICULOUSLY LOW PRICES

How Does Harbor Freight Sell GREAT QUALITY Tools at the LOWEST Prices?

We have invested millions of dollars in our own state-of-the-art quality test labs and millions more in our factories, so our tools will go toe-to-toe with the top professional brands. And we can sell them for a fraction of the price because we cut out the middle man and pass the savings on to you. It's just that simple! Come visit one of our 600 Stores Nationwide.

SUPER COUPON

20% OFF

ANY SINGLE ITEM

Limit 1 coupon per customer per day. Save 20% on any 1 item purchased. *Cannot be used with other discount, coupon or any of the following items or brands: Inside Track Club membership, extended service plan, gift card, open box item, 3 day parking lot sale item, compressors, floor jacks, saw mills, storage cabinets, chests or carts, trenchers, welders, Admiral, CoverPro, Daytona, Diablo, Franklin, Hercules, Holt, Jupiter, Predator, Stik-Tek, StormCat, Union, Vanguard, Viking. Not valid on prior purchases. Non-transferable. Original coupon must be presented. Valid through 4/8/16.

25296126

SUPER COUPON

FREE

WITH ANY PURCHASE

PITTSBURGH 6 PIECE SCREWDRIVER SET

LOT 61313/62583
47770/62728
62570 shown

$4.99 VALUE

LIMIT 1 - Cannot be used with other discount, coupon or prior purchase. Coupon good at our stores, HarborFreight.com or by calling 800-423-2567. Offer good while supplies last. Shipping & Handling charges may apply if not picked up in-store. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one FREE GIFT coupon per customer per day.

25321477

WOW SUPER COUPON

SAVE $349

2.5 HP, 21 GALLON 125 PSI VERTICAL AIR COMPRESSOR

CENTRALPNEUMATIC

Customer Rating

LOT 61454/61693/62803/69091/67847 shown

$149.99 ~~$179.99~~

comp at $499

25318451

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

SAVE 57%

7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP

LOT 69249/69115/69137
69129/69121/877 shown

Customer Rating

$3.99

comp at $9.38

25246600

LIMIT 8 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

RAPID PUMP® 1.5 TON ALUMINUM RACING JACK

PITTSBURGH AUTOMOTIVE

- 3-1/2 Pumps Lifts Most Vehicles
- Weighs 32 lbs.

SAVE $60

Customer Rating

$59.99

comp at $119.99

LOT 69252
68053/62160
62496/62516
60569 shown

25265842

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

ELECTRIC CHAIN SAW SHARPENER

CHICAGO ELECTRIC POWER TOOLS

Customer Rating

LOT 61613
68221 shown

SAVE 40%

4-1/4" grinding wheel included.

$29.99

comp at $49.99

25334406

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

SAVE 39%

TWO TIER COLLAPSIBLE EASY-STORE STEP LADDER

LOT 67514

Customer Rating

- 225 lb. Capacity

$19.99

comp at $32.99

25262059

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

WOW SUPER COUPON

SAVE $633

US★GENERAL PRO

26", 16 DRAWER ROLLER CABINET

Customer Rating

- 1060 lb. Capacity
- 14,600 cu. in. of storage

LOT 61609/67831 shown

$319.99 ~~$369.99~~

comp at $952.99

25270253

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

1500 WATT DUAL TEMPERATURE HEAT GUN (572°/1112°)

drillmaster

Customer Rating

LOT 62340
62546
96289 shown

SAVE 70%

$8.99

comp at $29.97

25271477

LIMIT 9 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

BADLAND

Customer Rating

2500 LB. ELECTRIC WINCH WITH WIRELESS REMOTE CONTROL

SAVE $200

$59.99

comp at $259.99

LOT 61258 shown
61840/61297/68146

25271583

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

WOW SUPER COUPON

POWDER-FREE NITRILE GLOVES PACK OF 100

Item 68498 shown

- 5 mil thickness

Customer Rating

SAVE 56%

HARDY

YOUR CHOICE $6.49 ~~$7.99~~

comp at $14.97

SIZE	LOT
MED	68496/61363
LG	68497/61360
X-LG	68498/61359

25287053

LIMIT 7 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

WOW SUPER COUPON

60 LED SOLAR SECURITY LIGHT

SAVE 56%

Bunker Hill Security®

LOT 62534/69643 shown

$30.30 ~~$39.99~~

Includes 6V, 900 mAh NiCd battery pack.

comp at $69.99

2530178

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

PITTSBURGH AUTOMOTIVE

2 TON FOLDABLE SHOP CRANE

Customer Rating

- Includes Ram, Hook and Chain

SAVE $120

LOT 60388
69514 shown

$179.99

comp at $299.99

25274241

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

SUPER COUPON

Customer Rating

900 PEAK/ 700 RUNNING WATTS 2 HP (63 CC) 2 CYCLE GAS RECREATIONAL GENERATOR

NEW

LOT 60338
69381 shown

SAVE $68

$99.99

comp at $168.97

STORM CAT

25278140

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 4/8/16. Limit one coupon per customer per day.

- 100% Satisfaction Guaranteed
- Over 25 Million Satisfied Customers
- No Hassle Return Policy
- Lifetime Warranty On All Hand Tools

- 600 Stores Nationwide
- HarborFreight.com 800-423-2567

Hitec RCD HG3XA 3-Axis Flight Stabilizer

Helicopter pilots have enjoyed the advantages of tail-rotor gyros for years, and their use today is totally a requirement. The newest form of flight stabilization—those with three-axis output—are aimed squarely at the fixed-wing RC pilot, and these, too, are quickly becoming standard issue when it comes to fitting out RC airplanes. The new HG3XA Flight Stabilizer Gyro System offers aileron, elevator, and rudder stabilization and is quick and easy to install. By simply moving a reliable mechanical jumper, the HG3XA can be set up for Normal, V-Tail, and Delta-wing airplanes. The unit is compact and lightweight, and comes with foam mounting tape and Male/Male extension leads to connect the unit between your servos and receiver. Installation takes about two minutes.

The HG3XA gyro uses angular-motion detection for accurate and instantaneous response to unwanted movement of your airplane around neutral. Three adjustment potentiometers allow you to separately adjust the gyro gain for aileron, elevator, and rudder. An auxiliary-channel port is also provided so that you can toggle between three different flight modes in flight: Off, Standard, and Heading Hold.

Installed in my .60-size Florio Flyer sport plane, the 0.39-ounce HG3XA worked great, and I felt like the Expo settings had been bumped up slightly but remained very comfortable. Even in inverted flight, the flight stabilization of the main flight controls was noticeable. Priced at $29.99, the Hitec HG3XA is an excellent and affordable onboard flight accessory that any pilot, from novice to expert, will appreciate.
—Gerry Yarrish
hitecrcd.com

SKS Video Productions 16th Annual NEAT Fair

When it comes to RC events, most are specific to a type of modeling, such as scale, racing, or gliders. The annual NEAT (Northeast Electric Aircraft Technology) Fair held in Downsville, New York, is an amazing combination of all sorts of RC modeling that is electric powered. The 16th annual event was no different, and from the latest ARFs and scratch-built beauties to helicopters, electric jets, and aerobatic fliers, there is always something in the air—and on the flightline—for everyone's interests.

The newest DVD from SKS Video Productions takes you right to the heart of all the E-power action and you get to see it all from the center of the pilot's stations. Want a full-size Iron Man (albeit made from flat foam boards)? Gary Graf's variation was there. How about a twin-engine cargo plane lifting an RC Space Shuttle and then launching it on its way for a one-minute controlled glide back to home base? Yep, Jason McQuistion made it happen. Another great thing about the NEAT Fair is all of the inspiring novelty aircraft that show up. Pete Foss's Snoopy on a flying skateboard and Arlen Harbaugh's 90mm ducted-fan-powered Zeffer flying wing are just two that demonstrate the broad scope of designs at the fair.

Expertly edited by Scott Stauffer and Greg Cardillo, this informative and fun-to-watch DVD has a running time of 102 minutes and is priced at $19.95 (the Blu-ray version, at $21.95, has a 110-minute running time). If you can't make it to the NEAT Fair, this DVD is the next best thing. *—Gerry Yarrish*
sksvideo.com

AT YOUR SERVICE

Subscription questions?

For print and digital subscriptions, go to **ModelAirplaneNews.com/cs** or call us at (800) 827-0323. Outside the U.S. call +(386)246-3323

Membership questions?

For Premium Site membership questions, email **mowebmaster@airage.com** or call (888) 235-2021

New Address?

Go to **ModelAirplaneNews.com/cs**, or to change by mail, attach the address label from your magazine to this form and mail to:

Model Airplane News
P.O. Box 420134
Palm Coast, FL 32142-0235

NAME

NEW ADDRESS

CITY, STATE, ZIP

Want a Premium Site membership, digital edition, back issues, special issues, books, or DVDs?

Great Gift Idea!

Go to **AirAgeStore.com**

100% satifaction guaranteed
If you are ever dissatisfied, you may cancel your subscription at any time and receive a full refund for all unmailed issues.

Classifieds

MODEL AIRPLANE KIT FACTORY FOR SALE, $2000. WILLAIRCO crash resistant composites, founded 1976 in Jerusalem. Call Mitchell Williams 386-329-8603.

LASER-CUT MUFFLER/EXHAUST GASKETS: For most 2-stroke RC engines. Ultra High Quality, High Temperature, Flexible, Long Lasting. Now adding Head and Crankcase gaskets. Sold in 2 Packs. Only $1.75 Shipping per order, $2.75 international, ANY quantity! Many other great hobby items, including several plywood kits for RC planes. ICBIMProducts.com

GIANT SCALE PLANS and Outlines: DH2, Gee Bee, Fokker, and many more. Reply with SASE to: ModelCadds, PO Box 103, Valrico, FL 33595.

FOR SALE: MORTON M-5, five cylinder radial model aircraft engine. Ed Whitson, 208-686-1045 PST, ewhitsonn@gmail.com

AEROSCOTT MODEL ENGINE SERVICE Since 1989, 2- and 4-cycle, gas and glow, complete service. Custom machining and fabrication services. 909-562-7106 aeroscott.com 10820 Central Ave., Ontario, Calif 91762 aeroscott89@gmail.com

WANTED: VECO Tomahawk kit circa 1950s. B/W checkerboard box. Original design. OK Models Altech Marketing EZ P-51 Voodoo Reno Racer. Foam and wood construction. Joe Hass (248) 321-7943; joehass@gmail.com

VINTAGE R/C PLANS 60 scale R/C plans and plastic parts. Classic airplanes, WW I, WW II aircraft, catalog $3.00. 5105 Pine Hill Circle, Howell, Michigan 48843. (810) 227-1174; vintagercplans.com

WANTED: Wen-Mac® Cessna® 175, made in 1962; need not run, but complete, for display. E. Thompson, Box 277, Kimball, WV 24853, (910) 515-9036

$$$$ FOR ENGINES—BUYING & SELLING Model airplane engines—Estate sales my specialty—Consignments on percentage—28 years experience—Bob Boumstein, 6551 Arrowbear Lane, North Las Vegas, NV 89084 e-mail: bbhwc@cox.net

SEVERAL KRAFT, PRO-LINE AND JR SINGLE STICK RADIOS FOR SALE. All are in good to excellent condition. Call Tom 951-599-9565

STRIPPED GLOW-PLUG THREADS: Repaired with stainless steel HeliCoils. 2-stroke heads up to .90 displacement $17.50 postpaid. Over .90 and 4-stroke heads $20.00 p.p. YS and Saito cylinders $22.50 p.p. Send head or cylinder only. If sending complete engine add $15.00. We can also repair stripped exhaust pipe threads in your 4-stroke head. HeliCoils are not available, but we can repair with a special brass adapter for $28.50 p.p. Include header pipe if sending head. C. F. Lee Mfg. Co. 10112 Woodward Ave., Sunland, CA 91040 (818) 352-3766

BOBBY'S HANGAR We build any project, and test. You fly and enjoy. List of quality new and used LM aircraft available. May consider trades. Also custom plane stands and workbenches (field and shop) for disabled chair bound pilots. Call Bob 559-332-2481 or e-mail bobbys_hangar@att.net

LEE CUSTOM ENGINES. Original ringed K&B 61s are back in production. Custom versions selectively hand-fit and assembled by designer Clarence Lee complete with muffler, PDP (Perry Directional Porting) and now equipped with a Perry carburetor - $165.00 plus $12.00 shipping. Your new or near new K&B 61 Customized including PDP - $28.50 plus $12.00 shipping. C. F. Lee Mfg. Co. 10112 Woodward Ave., Sunland, CA 91040. (818) 352-3766.

PALMER PLANS: are now distributed exclusively by PRECISION CUT KITS. See above ad for ordering information.

PRECISION CUT KITS finest quality and most complete laser cut kits in the industry. Most kits in stock, ready for shipping within 24 hours. Visit our website for information and ordering. www.precisioncutkits.com Visa/mc/check and money orders accepted. International orders welcome. 63 Carlton Ave., Ewing, NJ 08618: larrypck@aol.com; 609-538-1388 and fax 609-883-0926.

COLLECTORS, R/C MEMORABILIA, HUGE ESTATE SALE. Many items from the 1940s to present day. Engines (Ohlsson/Rice, Delong, Super Cyclone etc. etc.) kits, R/C equipment (Orbit), planes, (Top Flite Taurus, 1940s F/F Wanderer etc., etc.) r.t.jorgensen@q.com for complete listing. Prefer lot buyer.

BJ'S MODEL ENGINE SERVICE wbilljensen@gmail.com ; www.bj-model-engines.com

DON SMITH PLANS AND ACCESSORIES: Now owned and distributed exclusively by Precision Cut Kits.

USED ENGINES WANTED: pre-1970 preferred. T. Crouss, 100 Smyrna, West Springfield, MA 01089-1706; (413) 732-3859.

FOAMIE BUILDERS: Foam made in the USA just for model planes. www.modelplanefoam.com

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial—50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. All ads must be paid for in advance. To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 1st day of the month, 3 months in advance, e.g., January 1 for the April issue. We don't furnish box numbers, and it isn't our policy to send tear sheets. Please make all checks payable to: Air Age Inc. SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 88 Danbury Road, Wilton, CT 06897 USA

RCMarketplace

The newest merchandise and best values just for you.

Final Approach

BY **THE *MODEL AIRPLANE NEWS* CREW** PHOTOS BY **ROBB ENRIGHT**

Pilots Matt Chapman (left) and Dave Malchione Jr. (right) pose with their respective airshow planes.

RC and Full-Size

Coordinated aerobatic formation flight

Sponsored by Embry-Riddle Aeronautical University, Matt Chapman is both a solo airshow pilot and the lead pilot for the 4CE formation aerobatic team. Matt is also an accomplished RC giant-scale and turbine jet pilot. It was only natural that Matt would come up with a formation demonstration combining both full-size and giant-scale RC aircraft.

Developed and fine-tuned by Matt along with his good friend and Futaba Air Team Manager Frank Noll, this unique combination gives the appearance of a synchronized-formation demonstration. The demo has been performed at the AirVenture convention for the past two years. Matt also performs the demonstration flight at the New Garden Airshow in Pennsylvania, teamed up with RC pilot Dave Malchione Jr.

Here's Dave's take from the RC side of this exciting and unique aerobatic demonstration.

MAN: ***How do you coordinate your flights during the demonstrations?***
Dave Malchione Jr.: Both of us are in total contact and communicate with each other via radio to keep the maneuvers synchronized and precise. The timing of all the maneuvers and their placement to give the proper image of a close formation can make or break our routine, and when it all comes together, it is truly a sight to see.

MAN: ***Tell us about your performance at the New Garden Airshow.***
DM: This year's show, as described by Matt, was right on the mark. With Matt's vantage point, he can visually see my model with respect to it being a true formation flight. At this recent event, he was flying his new Extra 330LX and I was flying my Hangar 9 Yak during Saturday's show. On Sunday, I flew the Carden 40% Extra.

Our routine starts with a level pass by both aircraft with about six minutes for maneuvers. We perform a coordinated loop, a four-point roll, followed by a humpty bump and a half Cuban-8. We follow this with an avalanche, a hammerhead stall turn, a humpty bump with a quarter roll down, and our final maneuver—the converging split. As shown in the photo, the split is the hardest because the placement and timing are crucial for the right effect, and when that happens the spectators love it.

MAN: ***Tell us about the airshow aircraft.***
DM: Both my Carden Extra and the Hangar 9 Yak use a Spektrum DX18 transmitter with Spektrum servos. The Extra is powered by a DA-150 engine, while the Yak has a DA-120 gas engine. Matt's full-size Extra 330LX can pull up to 10 Gs and boasts 320 horsepower.

MAN: ***How have the crowds reacted to this kind of demonstration?***
DM: When it all comes together, the spectators love it as it really is a new form of airshow entertainment. We both agree it is a great adrenaline rush proving that RC models and full-scale aircraft can safely share the airspace, performing at the same time. This airshow draws huge crowds, and many commented that this was the highlight of the day. Also, I think it is a great plus regarding the AMA/FAA relations during the recent (and often tense) RC mode/multirotor concerns.

MODEL SETUPS MADE SIMPLE

DOWNLOAD • UPLOAD • FLY

Voice alerts, 250-model memory and a wireless trainer link aren't the only advantages you get with a next generation Spektrum™ transmitter. You also get access to a growing library of over 50 pre-programmed setups for some of the most popular Horizon Hobby aircraft. With these setups, you can opt to skip the programming process and get flying faster. Just download the one you want to an SD card, upload it to your transmitter and you're ready to fly.

`To see the entire selection of available model setups, go to spektrumRC.com/setups

SPEKTRUM®
Innovative Spread Spectrum Technology

HORIZON® HOBBY | VISIT Your Local Retailer | CLICK horizonhobby.com | CALL 1.800.338.4639 | SERIOUS FUN.®

 48805

TWINSTAR™ EP ARF

Almost-Ready-to-Fly Electric Twin Motor Sport Plane

Double-barreled flying fun!

Flying a twin is a unique experience, made easy and exciting with the Twinstar ARF. Add two electric motors — they're a snap to set up — and you'll have all the power you need to stand out at the field. Step up to the Twinstar ARF. It's one sport plane that delivers twice the fun!

GREAT PLANES® MODEL MANUFACTURING COMPANY

greatplanes.com/135h

Scan the QR code to see the Twinstar in action!

3072908

HOBBICO